WEIL-McLAIN®

GOLD CGt

Gas-Fired Water Boiler
with Tankless Heater

Boiler Manual

- Installation
- Maintenance
- Startup
- Parts

WARNING **DO NOT USE BOILER DURING CONSTRUCTION** unless you provide dust-free air to the boiler area or follow the requirements given on page 9. Failure to comply could result in severe personal injury, death or substantial property damage.

Mobile Product Library

WARNING This manual must only be used by a qualified heating installer/service technician. BEFORE installing, read all instructions in this manual and all other information shipped with the boiler. Perform steps in the order given. Failure to comply could result in severe personal injury, death or substantial property damage.

Part number 550-110-290/0212

How it works . . .

① Control module

The control module responds to signals from the room thermostat, tankless heater low limit, air pressure switch and boiler limit circuit to operate the boiler circulator, pilot burner, gas valve and inducer. When room thermostat calls for heat, the control module starts the system circulator and inducer.

The control module runs the inducer long enough to purge the boiler flue passages, then opens the pilot valve and activates pilot ignition spark.

The control module allows up to 15 seconds to establish pilot flame. If flame is not sensed within 15 seconds, the control module will turn off the gas valve, flash the Flame light, and then enter a 15-second postpurge. The control module will then start a new cycle. This will continue indefinitely until pilot flame is established or power is interrupted. Once pilot flame is proven, the control module opens the gas valve to allow main burner flame.

When the room thermostat is satisfied, the control module turns off the gas valve, operates the inducer for a 15-second postpurge and waits for the next heat call.

The control module indicator lights show normal sequence when the lights are on steady. When a problem occurs, the control module flashes combinations of lights to indicate the most likely reason for the problem (see page 47).

② Transformer

The control transformer reduces line voltage to 24 volts for the gas valve circuit.

③ Inducer

The inducer pulls flue gases through the boiler, causing air to be pulled in through the boiler air openings. The inducer pushes the flue gases through the vent pipe as well. The inducer is shipped with gasket and 4 nuts inside a carton located inside the crate. See Figure 36 on page 59 for proper installation of inducer.

④ Air pressure switch

The air pressure switch signals the control module, telling the control module whether the inducer is working correctly or the vent is blocked.

⑤ High limit

The high limit turns off the gas valve if the temperature in the boiler goes above its setting. (The circulator will continue to run as long as there is a call for heat.)

⑥ Boiler circulator

The boiler circulator circulates water through the external (system) piping. The circulator is shipped loose, and ***must be mounted on the boiler return piping*** as shown.

NOTE — The control module provides a pump exercising routine. If the boiler is not operated for 30 days, the control module will power the circulator for 30 seconds, then turn off.

⑦ Tankless heater low limit control

This control provides domestic priority by diverting all available heat to domestic water heating whenever it senses water temperature below its setting.

⑧ 3-Way valve

If the tankless heater low limit control senses boiler water is too cool to provide domestic water from the coil, the 3-way valve diverts all of the hot water flow from the boiler back to the return, dedicating all available heat for domestic water. The 3-way valve is shipped inside the inducer carton. ***You must install this valve and fittings as shown. See pages 21 and 64 for details***

Make sure the valve body is in the correct position as shown on page 3 and Figure 39, page 64. Valve port "A" must connect to boiler supply piping. Valve port "AB" must connect to boiler return piping. Valve port "B" must be used for the system return connection. This allows water to flow normally from port "B" to port "AB" during a space heating cycle. The valve stops space heating circuit flow and switches to full recirculation (flow from port "A" to port "AB") when the tankless heat low limit control closes.

⑨ Tankless heater

The tankless heater uses hot boiler water to heat domestic water.

⑩ Wires to ambient temperature switch

Install the switch and bracket supplied with the boiler on the wall closest to the boiler, within 5 inches of the enclosure ceiling. This switch senses the ambient temperature in the boiler space. Should boiler room temperature rise too high due to insufficient ventilation air, the switch will cycle the boiler off when the temperature at the switch reaches 135°F.

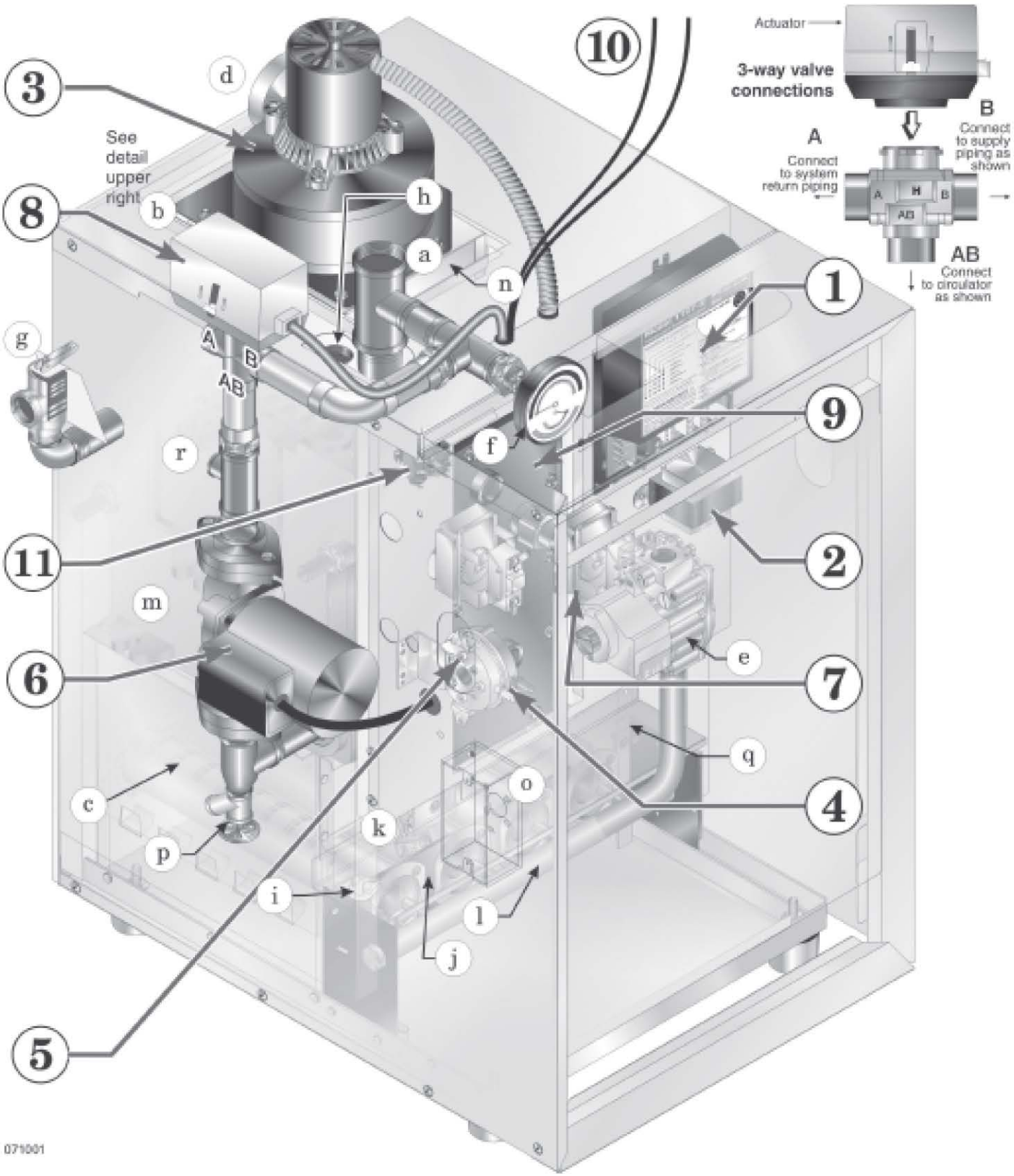
⑪ Control Relay

Provides switching from domestic mode to heating mode.

Other boiler components:

- **a** supply to system
- **b** return from system
- **c** stainless steel burners
- **d** flue outlet
- **e** gas valve
- **f** pressure/temperature gauge
- **g** relief valve
- **h** air vent connection
- **i** flame rollout thermal fuse element (TFE)
- **j** burner holding bracket
- **k** pilot burner and bracket
- **l** gas manifold
- **m** cast iron boiler sections
- **n** flue collector
- **o** junction box
- **p** drain valve
- **q** burner shield
- **r** expansion tank line connection

CGt Gas-Fired Water Boiler with tankless heater



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Hazard definitions

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels or to important information concerning the life of the product.

⚠ DANGER Indicates presence of hazards that **will cause severe** personal injury, death or substantial property damage.

⚠ WARNING Indicates presence of hazards that **can cause severe** personal injury, death or substantial property damage.

⚠ CAUTION Indicates presence of hazards that **will or can cause minor** personal injury or property damage.

NOTICE Indicates special instructions on installation, operation or maintenance that are important but not related to personal injury or property damage.

Part Number 550-110-290/0212

Please read before proceeding

Installer

⚠WARNING **Read all instructions before installing.** Follow all instructions in proper order to prevent personal injury or death.

- Consider **piping and installation** when determining boiler location.
- Any **claims for damage or shortage in shipment** must be filed immediately against the transportation company by the consignee.

User

- **This manual is for use only by your qualified heating installer/service technician.**
- Please refer to the **User's Information Manual** for your reference.
- We recommend regular **service by a qualified service technician, at least annually.**

⚠WARNING The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on **page 68** of this manual. Failure to comply could result in severe personal injury.

NOTICE When calling or writing about the boiler— Please have the boiler model number from the boiler rating label and the Consumer Protection (CP) number from the boiler jacket. You may list the CP number in the space provided on the **Installation and service certificate** found on page 33.

⚠WARNING Failure to adhere to the guidelines on this page can result in severe personal injury, death or substantial property damage.

When servicing boiler —

- To avoid electric shock, disconnect electrical supply before performing maintenance.
- To avoid severe burns, allow boiler to cool before performing maintenance.

Boiler operation —

- Do not block flow of combustion or ventilation air to boiler.
- Should overheating occur or gas supply fail to shut off, do not turn off or disconnect electrical supply to circulator. Instead, shut off the gas supply at a location external to the appliance.
- Do not use this boiler if any part has been under water. Immediately call a qualified service technician to inspect the boiler and to replace any part of the control system and any gas control that has been under water.

Boiler water —

- Do not use petroleum-based cleaning or sealing compounds in boiler system. Water seal deterioration will occur, causing leakage between sections. This can result in substantial property damage.
- Do not use "homemade cures" or "boiler patent medicines". Serious damage to boiler, personnel and/or property may result.
- Continual fresh makeup water will reduce boiler life. Mineral buildup in sections reduces heat transfer, overheats cast iron, and causes section failure. Addition of oxygen and other gases can cause internal corrosion. Leaks in boiler or piping must be repaired at once to prevent makeup water.
- Do not add cold water to hot boiler. Thermal shock can cause sections to crack.

Glycol — potential fire hazard —

All glycol is flammable when exposed to high temperatures. If glycol is allowed to accumulate in or around the boiler or any other potential ignition source, a fire can develop. In order to prevent potential severe personal injury, death or substantial property damage from fire and/or structural damage:

- Never store glycol of any kind near the boiler or any potential ignition source.
- Monitor and inspect the system and boiler regularly for leakage. Repair any leaks immediately to prevent possible accumulation of glycol.
- Never use automotive antifreeze or ethylene glycol in the system. Using these glycols can lead to hazardous leakage of glycol in the boiler system.

1a Prepare boiler location — codes & checklist

Installations must follow these codes:

- Local, state, provincial, and national codes, laws, regulations and ordinances.
- National Fuel Gas Code, ANSI Z223.1–latest edition.
- Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1, when required.
- National Electrical Code.
- For Canada only: B149.1 or B149.2 Installation Code, CSA C22.1 Canadian Electrical Code Part 1 and any local codes.

NOTICE The CGt boiler gas manifold and controls met safe lighting and other performance criteria when boiler underwent tests specified in ANSI Z21.13–latest edition.

Before locating the boiler, check the following:

- Check for nearby connection to:
  - System water piping
  - Venting connections
  - Gas supply piping
  - Electrical power
- Check area around boiler. **Remove any combustible materials, gasoline and other flammable liquids, or other contaminants.**

⚠WARNING Failure to keep boiler area clear and free of **combustible materials, gasoline and other flammable liquids and vapors** can result in severe personal injury, death or substantial property damage.

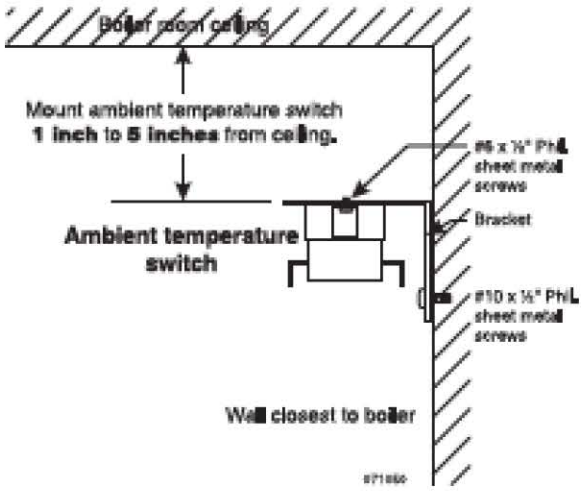
- Boiler must be installed so that gas control system components are protected from dripping or spraying water or rain during operation or service.
- If new boiler will replace existing boiler, check for and correct system problems, such as:
  1. System leaks causing oxygen corrosion or section cracks from hard water deposits.
  2. Incorrectly-sized expansion tank.
  3. Lack of antifreeze in boiler water causing system and boiler to freeze and leak.

NOTICE Read and follow the special instructions for the Commonwealth of Massachusetts, located on page 44 of this manual.

1b Install ambient temperature switch

Before placing boiler in boiler room, mount the **ambient temperature switch** on the wall that will be closest to the boiler as shown at right. Mount the switch **no more than 5 inches from the ceiling**, as shown. Connect the switch wires to the switch after placing the boiler in position.

⚠WARNING The ambient temperature switch prevents overheating of the boiler components and combustible materials in the vicinity of the boiler in the event ventilation air should be blocked. Failure to install the switch as shown could result in severe personal injury, death or substantial property damage.


Boiler room ceiling
Mount ambient temperature switch
1 inch to 5 inches from ceiling.
#6 x ½" PhL sheet metal screws
Bracket
Ambient temperature switch
#10 x ½" PhL sheet metal screws
Wall closest to boiler

1c Prepare boiler location — clearances

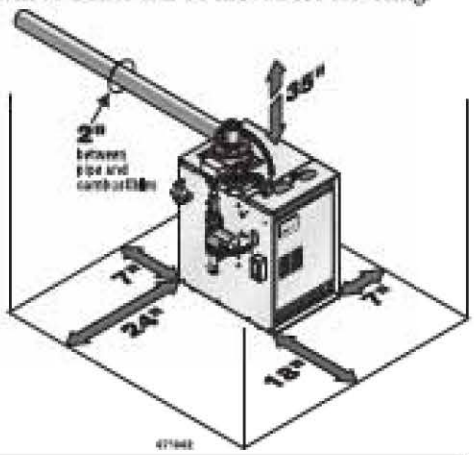
Recommended SERVICE clearances (Fig. 1)

1. Provide clearances for cleaning and servicing the boiler and for access to controls and components. See Figure 1 for recommendations.
2. Provide at least screwdriver clearance to jacket front panel screws for removal of front panel for inspection and minor service. If unable to provide at least screwdriver clearance, install unions and shutoff valves in system so boiler can be moved for servicing.

Figure 1

Recommended **SERVICE** clearances

(see **WARNING** below)



⚠WARNING **If any clearance is less than in Figure 1, provide openings for combustion and ventilation air *located on the wall or door opposite the boiler FRONT (see Figure 2).***

These openings must be located as shown in Figure 2 to provide proper air flow around the boiler. The free area of each opening (after deducting for louvers) must be at least **one square inch per 1,000 Btuh** of boiler input. If the building is of unusually tight construction (see page 11 for definition), the air openings must connect directly to outside or the building must have air openings to the outside as specified on page 11.

If clearances are equal to or greater than Figure 1, see pages 10 and 11 for location and sizing of combustion air openings.

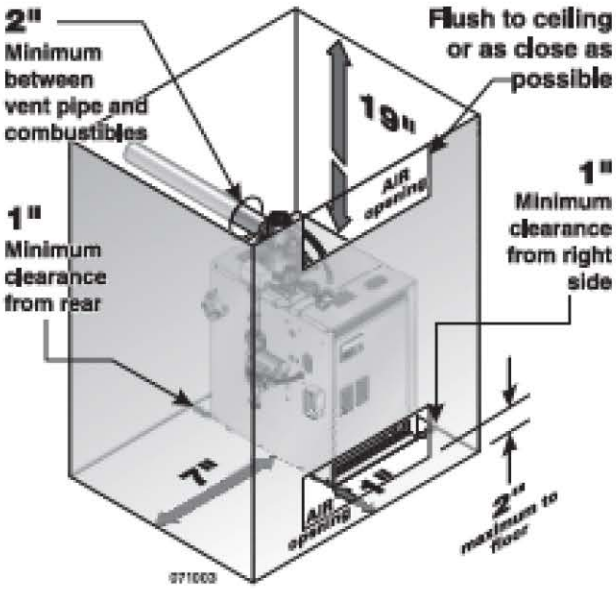
Failure to comply can result in severe personal injury, death or substantial property damage and reduced boiler life.

Required MINIMUM clearances (Fig. 2)

⚠WARNING **Never install the boiler in a space with clearances less than the minimum clearances shown in Figure 2.** Failure to comply can result in severe personal injury, death or substantial property damage and reduced boiler life.

1. **Hot water pipes: at least ½ inch** from combustible material.
2. **Single-wall vent pipe: at least 6 inches** from combustible material.
3. **Type B double-wall metal vent pipe:** refer to vent manufacturer's recommendation for clearances to combustible material.

Figure 2 Required **MINIMUM** clearances



Flooring

The CGi boiler is approved for installation on combustible flooring, but must never be installed on carpeting.

⚠WARNING Do not install boiler on carpeting even if foundation is used. Fire can result, causing severe personal injury, death or substantial property damage.

Foundation

1. Provide a solid brick or minimum 2-inch thick concrete foundation pad if any of the following is true:
   - floor can become flooded.
   - the boiler mounting area is not level.
2. Minimum dimensions are **25" long** by **18" wide.**

Residential garage installations

Take the following special precautions when installing the boiler in a residential garage. If the boiler is located in a residential garage, per ANSI Z223.1:

- Mount the boiler a minimum of **18 inches above the floor** of the garage to assure the burner and ignition devices will be no less than 18 inches above the floor.
- Locate or **protect the boiler** so it cannot be damaged by a moving vehicle.

1d Prepare boiler location — vent system

⚠WARNING Failure to follow all instructions can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

⚠ DANGER Inspect existing chimney before installing boiler. Failure to clean or replace perforated pipe or tile lining will cause severe personal injury or death.

⚠ DANGER **Direct exhaust venting (Category III)** — Do not common vent (sidewall vent only) the CGt in a direct exhaust system (Category III). Connecting more than one appliance to a direct exhaust system will cause flue gas spillage or appliance malfunction, resulting in possible severe personal injury, death or substantial property damage.

When removing boiler from an existing common vent system:

At the time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

a. **Seal any unused openings** in the common venting system.

b. **Visually inspect the venting system** for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion or other deficiencies which could cause an unsafe condition.

c. **Test vent system** — Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.

d. **Place in operation** the appliance being inspected. Follow the lighting/operating instructions. Adjust thermostat so appliance will operate continuously.

e. **Test for spillage** at draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle.

f. After it has been determined that **each appliance** remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers, and any other gas-burning appliance to their previous conditions of use.

Any improper operation of common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1-latest edition. Correct by resizing to approach the minimum size as determined using the appropriate tables in Part 11 of that code. Canadian installations must comply with B149.1 or B149.2 Installation Code.

Chimney or vent requirements

1. Venting must be installed according to Part 7, Venting of Equipment, of National Fuel Gas Code, ANSI Z223.1-latest edition and applicable building codes. Canadian installations must comply with B149.1 or B149.2 Installation Codes.

2. See Ratings table on page 67 for minimum chimney or vent sizes. A chimney or vent **without a listed cap** should extend **at least 3 feet above the highest point** where it passes through a roof of a building and **at least 2 feet higher** than **any portion of a building within a horizontal distance of 10 feet.** A chimney or vent must not extend less than the distances stated above.

3. A lined chimney is preferred and must be used when required by local, state, provincial and national codes, laws, regulations and ordinances. Vitreous tile linings with joints that prevent retention of moisture and linings made of non-corrosive materials are best. Advice for flue connections and chimney linings can be obtained from local gas utility. **Type B** double-wall metal vent pipe or single-wall vent pipe may be used as a liner.

4. Cold masonry chimneys, also known as outside chimneys, typically have one or more walls exposed to outside air. When any atmospheric gas-fired boiler with automatic vent damper is vented through this type of chimney, the potential exists for condensation to occur. Condensation can damage a masonry chimney. Weil-McLain recommends the following to prevent possible damage.

   a. Line chimney with corrosion-resistant metal liner such as AL29-4C® single-wall stainless steel or B-vent. Size liner per National Fuel Gas Code ANSI Z223.1-latest edition.

   b. Provide drain trap to remove any condensate.

1e Prepare boiler location — contamination

Please review the following information on potential combustion air contamination problems.

Refer to **Table 1** for products and areas which may cause contaminated combustion air.

⚠WARNING

To prevent potential of severe personal injury or death, check for products or areas listed below before installing boiler. If any of these contaminants are found:

- remove contaminants permanently

— OR —

- isolate boiler and provide outside combustion air. See national, provincial or local codes for further information.

Table 1 Corrosive or destructive contaminants and likely locations

Products to avoid	Areas likely to have contaminants
Spray cans containing chloro/fluorocarbons	Dry cleaning/laundry areas and establishments
Permanent wave solutions	Swimming pools
Chlorinated waxes/cleaners	Metal fabrication plants
Chlorine-based swimming pool chemicals	Beauty shops
Calcium chloride used for thawing	Refrigeration repair shops
Sodium chloride used for water softening	Photo processing plants
Refrigerant leaks	Auto body shops
Paint or varnish removers	Plastic manufacturing plants
Hydrochloric acid/muriatic acid	Furniture refinishing areas and establishments
Cements and glues	New building construction
Antistatic fabric softeners used in clothes dryers	Remodeling areas
Chlorine-type bleaches, detergents, and cleaning solvents found in household laundry rooms	Garages with workshops
Adhesives used to fasten building products and other similar products	Buildings under construction (where air is contaminated with particulates)
Airborne particulates (drywall dust, fiberglass particles, road or gravel dust, lint, etc.)	

⚠WARNING

CONSTRUCTION DUST HAZARD — Airborne particulates, such as drywall dust or fiberglass dust, will cause blockage of the CGt burners, resulting in carbon monoxide production, a fire hazard, or building freeze damage. If the boiler is operated during construction, you must isolate the boiler to provide clean air for combustion. **If you are unable to ensure uncontaminated air in the boiler vicinity at all times, you must inspect the boiler at least once weekly.** When inspecting, clean the burners if necessary using the procedure given on page 41. Failure to follow these guidelines could result in severe personal injury, death or substantial property damage.

1f Prepare boiler location — air openings

⚠WARNING

Combustion air opening location and sizing requirements depend on the clearances around the boiler. Check the boiler placement compared to Figure 1, page 7.

If all clearances are at least equal to Figure 1, page 7, apply the sizing and placement of openings given on pages 10 and 11.

If ANY clearance is less than Figure 1, page 7, you must provide air openings sized and located as shown in Figure 2, page 7. **DO NOT** apply the sizing and location information shown on page 10 or 11.

Air openings must be provided

Combustion air and ventilation openings must comply the National Fuel Gas Code ANSI Z223.1-latest edition, or applicable local building codes. Canadian installations must comply with B149.1 or B149.2 Installation Codes.

⚠WARNING

Provide adequate combustion and ventilation air to assure proper combustion and reduce the risk of severe personal injury, death or substantial property damage caused by flue gas spillage and carbon monoxide emissions.

Air opening options

Two openings — Air supply from inside the building ✷

1. If the building is of **unusually tight construction** (see definition, next page), the **building must also be provided with air openings directly to the outside**, sized and located per Figure 4, Figure 5 or Figure 6.
2. Buildings of typical construction should provide adequate combustion air from natural infiltration, so additional air openings to the building are not required.
3. See Figure 3. Provide **two openings** through the interior wall, within 12 inches of the ceiling and the floor, sized per Figure 3.

Two openings — Air supply directly from outside ✷

1. Air openings must be directly through an outside wall, or into a space that connects directly to the outside (such as a ventilated attic or crawl space, for example).
2. See Figure 4 — **Openings directly through an outside wall** — provide **two openings** within 12 inches of the ceiling and the floor, sized per Figure 4.
3. See Figure 5 — **Air supplied through vertial ducts** — provide **two openings** terminated within 12 inches of the ceiling and the floor, sized per Figure 5.
4. See Figure 6 — **Air supplied through horizontal ducts** — provide **two openings** within 12 inches of the floor and the ceiling, sized per Figure 6.

Figure 3 Air openings to interior spaces ✷

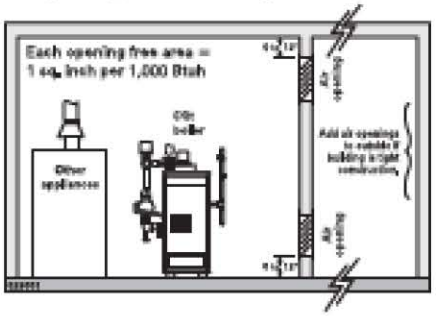


Figure 4 Air directly through outside wall ✷

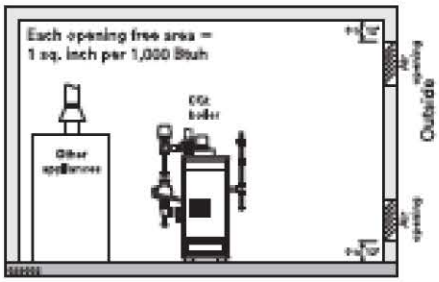


Figure 5 Air from outdoors — vertical ducts ✷

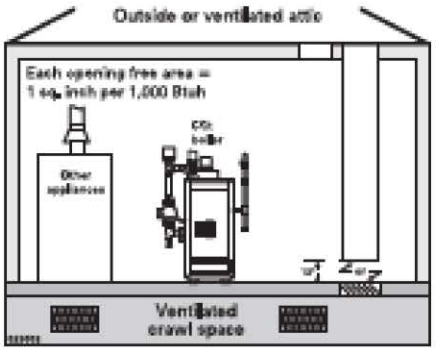
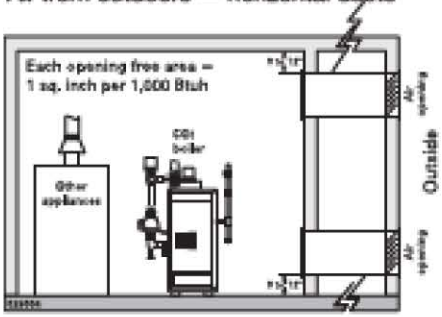


Figure 6 Air from outdoors — horizontal ducts ✷



Prepare boiler location — air openings (continued)

NOTICE

FREE AREA of openings — the minimum areas given in this manual are free area (equals the area, length times width of opening, after deduction for louver obstruction).

Use the free area information provided by the louver manufacturer. When this information is not available, assume:

- Wood louvers — assume free area is 20% of total; so the actual area of each opening with wood louvers would be 5 times the required free area.
- Metal louvers — assume free area is 60% of actual area; so, for wood louvers, the actual area of each opening must be 1.67 times the required free area.

Single air opening option ✷

A single combustion air opening can be used in lieu of the two-opening options on page 10, provided:

Clearances from boiler to walls

- The boiler must have clearances of at least those shown in Figure 1, page 7.

Opening must be directly to outside

- The opening must connect directly to the outdoors or to a space that communicates directly to the outdoors (not to an interior space).
- The air can be provided through a direct opening or through a horizontal or vertical duct.

Opening placement

- The top of the air opening must be within 12 inches of the ceiling.

Opening size

- The free area of the opening must be at least equal to the sum of the areas of all equipment vent connectors in the space, and . . .
- The free area of the opening must be at least 1 square inch per 3,000 Btu/hr input rating of all equipment located in the space.

Exception for large spaces ✷

No combustion air openings are needed when the boiler (and other appliances) are installed in a space with a volume **at least 50 cubic feet per 1,000 Btuh** of all installed appliances, provided:

- **the building must not have unusually tight construction** (see definition, this page)
- all clearances around the boiler must must be no less than shown in Figure 1, page 7.

To determine if the space is large enough to qualify:

- Add the total input of all appliances in MBH (1,000's of Btuh).
- Multiply this number times 50 to determine minimum room volume.
- Example: For a total input of 100 MBH (100,000 Btuh), minimum volume is 50 x 100 = 5,000 cubic feet. At a ceiling height of 8 feet, the space must have at least 5,000 ÷ 8 = 625 square feet (25 feet x 25 feet, for instance).

Unusually tight construction

Unusually tight construction means (per ANSI Z223.1) buildings in which:

a. Walls and ceilings exposed to the outside atmosphere have a continuous water vapor retarder with a rating of 1 perm or less with openings gasketed, and . . .

b. Weather-stripping has been added on openable windows and doors, and . . .

c. Caulking or sealants are applied to areas such as joints around windows and door frames, between sole plates and floors, between wall-ceiling joints, between wall panels, at penetrations for plumbing, electrical, and gas lines, and in other openings.

For such construction cases, if appliances use inside air for combustion, **provide air openings into the building from outside.** Size and locate these openings per the appropriate case in **Figure 4, 5 or 6** on page 10.

Exhaust fans and air movers

The appliance space must never be under a negative pressure, even if the appliance(s) are installed as direct vent. Always provide air openings sized not only to the dimensions required for the firing rate of all appliances, but also to handle the air movement rate of the exhaust fans or air movers using air from the building or space.

Motorized air dampers

If the air openings are fitted with motorized dampers, electrically interlock the damper to:

- Prevent the boiler from firing if the damper is not fully open.
- Shut the boiler down should the damper close during boiler operation.

To accomplish this interlock, wire an **isolated contact** (proving the damper open) in series with the thermostat input to the boiler. The boiler will not start if this contact is open, and will shut down should it open during operation.

2a Prepare boiler — placement and setup

Place boiler/crate near position

1. Leave boiler in crate and on pallet until installation site is ready.
2. Move entire crate and pallet next to selected location.
3. Remove crate.
4. Remove boiler from pallet.

NOTICE Do not drop boiler or bump jacket on floor or pallet. Damage to boiler can result.

   a. Tilt left side of boiler up and place a board under left legs.
   b. Tilt boiler the other way and place a board under right legs.
   c. Slide boiler backward off pallet and into position.

5. Check level.
   a. Shim legs, if necessary.
   b. Do not alter legs.

Install inducer assembly

1. Remove the inducer assembly (and gasket) from its shipping carton.
2. Place gasket on flue collector as shown in Figure 36, page 59. Make sure the gasket is in good condition.
3. Secure in place with four nuts provided in a plastic bag inside the inducer carton.
4. Wire inducer motor to control module by inserting Molex connector through right most jacket top conduit opening (see page 3 for finished assembly). Press strain relief bushing into hole. Insert Molex connector into mating connector on control module. Connectors are keyed and can only be inserted one way. See Figure 35, page 48, for location of connector on control module.

Inspect orifices and burners

⚠ DANGER Correctly-sized manifold orifices must be used. Failure to do so will result in severe personal injury, death or substantial property damage.

1. Remove front jacket door. Remove burner shield (see **Figure 37**, item **4**, page 62).
2. Verify that the orifice size is 2.7mm. (The orifice size is stamped on the orifice spud barrel.)
3. Reinstall burner shield.

⚠WARNING Do not operate boiler without burner shield in place. Failure to do so could result in severe personal injury, death or substantial property damage.

4. This product is used at sea level only.

Orifice replacement procedure (when required)

1. Remove the screws securing the burner shield and remove burner shield.
2. Using a 7/16" open-end wrench, remove the burner orifices from the manifold.
3. Apply a small amount of pipe dope to each of the new orifices and install in the manifold using a 7/16" open-end wrench. Make sure the orifices are aligned correctly, not cross-threaded in the manifold tappings.

⚠WARNING Use only pipe dope compatible with propane gas, even if boiler is to be operated on natural gas. Failure to comply could result in severe personal injury, death or substantial property damage.

4. Carefully replace the burner shield.
5. Follow the check-out procedure of Section **8** to ensure the boiler is now operating properly after orifices are replaced.

2b Prepare boiler — pressure test

Hydrostatic pressure test

Pressure test boiler **before** attaching water or gas piping (except as noted below) or electrical supply.

Prepare boiler for test

1. Remove the shipping nipple (from CGt supply tapping) and remove the boiler relief valve. **Temporarily** plug the relief valve tapping with a ¾" NPT pipe plug.
2. Remove 1¼" nipple, reducing tee and drain valve from circulator hardware bag. Install in boiler return connection as shown on page 3 and **Figure 39**, page 64 Install circulator on the return side.
3. Remove 1¼" nipple, 1¼" x 1¼" x 1" tee from circulator hardware bag and pressure/temperature gauge from inducer carton. Pipe to boiler supply connection as shown on page 3 and **Figure 39**, page 64. (Use pipe dope sparingly.)
4. Connect a hose to boiler drain valve, the other end connected to a fresh water supply. Make sure hose can also be used to drain boiler after test.
5. Connect a nipple and shutoff valve to system supply connection on the 1¼" tee. This valve will be used to bleed air during the fill. (Valve and nipple are not included with boiler.)
6. Connect a nipple and shutoff valve to system return connection (at circulator flange if circulator installed on return). This valve will be used to bleed air during the fill. (Valve and nipple are not included with boiler.)

Fill and pressure test

1. Open the shutoff valves you installed on supply and return connections.
2. Slowly open boiler drain valve and fresh water supply to fill boiler with water.
3. When water flows from shutoff valves, close boiler drain valve.
4. Close shutoff valves.
5. Slowly reopen boiler drain valve until test pressure on the pressure/temperature gauge reaches no more than:
   - **45 psig** for boilers with **30 psig relief valve.**
   - **75 psig** for boilers with **50 psig relief valve.**
6. **Test for no more than 10 minutes at:**
   - **45 psig** for boilers with **30 psig relief valve.**
   - **75 psig** for boilers with **50 psig relief valve.**

⚠WARNING **Do not leave boiler unattended.** A cold water fill could expand and cause excessive pressure, resulting in severe personal injury, death or substantial property damage.

7. Make sure constant gauge pressure has been maintained throughout test. Check for leaks. Repair if found.

⚠WARNING **Leaks must be repaired at once.** Failure to do so can damage boiler, resulting in substantial property damage.

⚠DANGER Do not use **petroleum-based** cleaning or sealing compounds in boiler system. Severe damage to boiler will occur, resulting in substantial property damage.

Drain and remove fittings

1. Disconnect fill water hose from water source.
2. Drain boiler at drain valve or out hose, whichever provides best access to drain. Remove hose after draining if used to drain boiler.
3. Remove nipples and valves unless they will remain for use in the system piping.
4. Remove plug from relief valve tapping. See page 20 to replace relief valve.

3a Venting — general information

CGt venting options — Chimney draft or Direct exhaust

Chimney draft venting

Chimney draft venting uses the natural draft provided by a vertical vent or chimney. Category I appliance (non-positive vent static pressure and vent gas temperature that avoids excessive condensate production in vent). See Section **3b**. Chimney draft installations use:

1. Vent connector (single or doublewall) sized to eliminate positive pressure in vent system. Diameter increases immediately at boiler.
2. Doublewall metal vent (B-vent) or chimney with liner approved by the National Fuel Gas Code, ANSI Z223.1–latest edition, or in Canada B149.1 or B149.2 Installation Code.

Direct exhaust venting (vertical or sidewall)

Direct exhaust venting uses inside combustion air with no combustion air connector piping. All CGt flue gas vents are pressurized, requiring careful sealing of all joints. Category III appliance (positive vent static pressure and vent gas temperature that avoids excessive condensate production in vent). See pages 15-19. Direct exhaust installations use:

1. Vent pipe specified in this manual.
2. Vent termination through outside wall, roof or unused chimney. Tight chimney areas will make vent joint construction very difficult.

3b Venting — chimney draft venting

Table 2

Vent connector diameter

Boiler model number	"D" Minimum vent connector diameter
CGt	5"

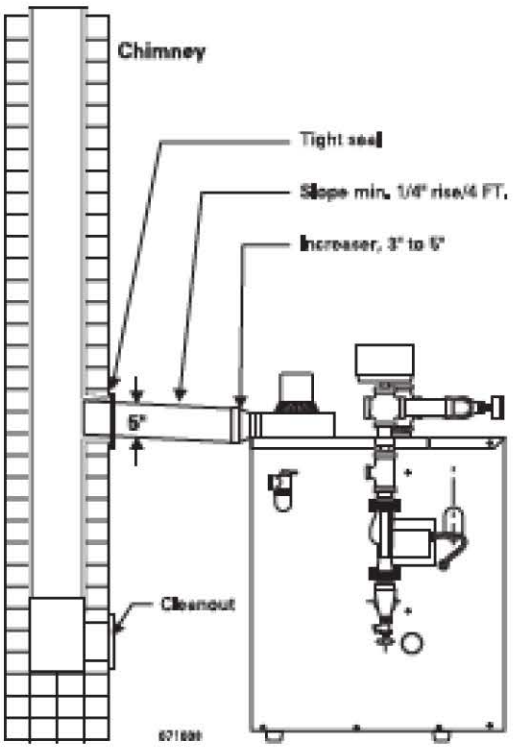
DANGER

Inspect existing chimney before installing boiler. Failure to clean or replace perforated pipe or lining will cause severe personal injury or death.

WARNING

Vent sizing given in **Table 2** is only a general guideline. The vent connector and chimney must be designed, sized and constructed in compliance with all applicable codes. Failure to correctly size and install the vent system could result in severe personal injury, death or substantial property damage.

Figure 7 Chimney draft venting



1. Use doublewall metal vent (B-vent) or chimney with liner as required by the National Fuel Gas Code, ANSI Z223.1–latest edition, or in Canada, B149.1 or B149.2 Installation Code.
2. To prevent downdrafts, chimney should extend at least 3 feet above the highest point where it passes through a roof and at least 2 feet higher than any portion of a building within a horizontal distance of 10 feet.
3. To vent with another appliance, see National Fuel Gas Code, ANSI Z223.1–latest edition or in Canada B149.2 or B149.2 Installation Code
4. Do not connect breeching to any portion of a mechanical draft system that can operate under positive pressure.
5. Maintain minimum 2" clearance from combustible materials to vent pipe.
6. Do not use chimney with an open fireplace.
7. Make horizontal runs as short as possible. Long runs can cause condensation.
8. When longer runs are used, support pipe with appropriate hangers.
9. To prevent blockage, do not vent into bottom of chimney.
10. Vent pipe must not go beyond inside wall of chimney.
11. Vent passing through floors or ceilings must be firestopped.
12. See **Figure 7** and **Table 2** to connect boiler to venting system.

3c Venting — direct exhaust — components

Obtain vent components

1. The following special gas vent systems comply with UL-1738 and ULC-S636 standards and are certified by CSA as the only systems suitable for use with CGt boilers (all 3" diameter):
   - Heat-Fab, Inc. **Saf-T Vent®**
   - Flex-L International, Inc. **StaR-34**
   - Z-Flex®, Inc. **Z-Vent II**
   - ProTech Systems **FasNSeal™**

⚠WARNING Use only the vent starter of the same manufacturer as the vent components. Do not mix components from different systems. The vent system could fail, causing flue gas spillage, resulting in severe personal injury or death.

2. Select vent method based on page 14 and installation requirements.
3. Refer to **Table 3** for maximum vent run lengths and number of elbows. Do not exceed data in **Table 3**.
4. Select vent components from **Table 4**. All components, including the vent starter, must be of the same vent manufacturer. Do not mix components.

Table 3 Maximum vent length

Max. vent length (feet)	Total number of elbows (Note 1)						
	0	1	2	3	4	5	6
CGt	40	33	26	19	12	5	--
Note 1:	Do not include termination fitting when counting total number of elbow.						

Table 4 Vent system components

Description	Saf-T Vent®	StaR-34	Z-Vent II	FasNSeal™
CGt Starter	73WMCGIS	SRAWCG3	SVEWMFA03	FSA-WEIL-CGI
Termination Coupling with Screen	73WMTERM	–	SVSTPX03	FSB3S
Termination Elbow with Screen	1314TERM	SRTE-03	SVSTEX0390	FSTE90
Termination Tee with Screen	7390TEE	SRTT-03	SVSTTX03	FSTT3
45° Elbow	7311GC	SRE4503	SVEEWC0345	FSEL4503
90° Elbow	7314GCTR	SRE9003	SVEEWC0390	FSEL9003
6" Pipe	7301GC	SR06P03	SVEPWC03.5	FSVL603
12" Pipe	7302GC	SR12P03	SVEPWC0301	FSVL1203
18" Pipe	7304GC	–	SVEPWC0318	FSVL1803
24" Pipe	7305GC	SR24P03	SVEPWC03	FSVL2403
36" Pipe	–	SR36P03	SVEPWC0303	FSVL3603
37 ½" Pipe	7307GC	–	–	–
Slip Connector (See NOTE)	7324GC9	SRSJ03	–	–
Horizontal Support	7323GC	–	–	FSSH
Horizontal Drain Tee	7320GC	SRTDH03	SVEDWC03	FSHDT3
Joiner Band	–	SRJB-14	–	–
Sealant	As specified by individual vent pipe manufacturer			Not required
NOTE: Slip Connector	Use slip connector to adjust for non-standard pipe lengths and Saf-T Vent® only, before termination coupling to terminate run.			

3d Venting — direct exhaust — vent starter

1. Select a vent pipe manufacturer and obtain all vent components needed, based on boiler location and venting method.
2. You must use the vent starter made by the vent pipe manufacturer. See **Table** 4, page 15, Vent system components, for part number of each component, listed by vent manufacturer.

⚠WARNING Use only the vent starter of the same manufacturer as the vent components. Do not mix components from different systems. The vent system could fail, causing flue gas spillage, resulting in severe personal injury or death.

3. Follow all applicable national, state, local or provincial codes when venting the CGt boiler.
4. Connect vent starter to blower housing outlet as shown in the **Figures** 8 through 11, right.
   a. Do not mix components from different vent manufacturers.
   b. Maintain minimum 2" clearance from combustible materials to vent pipe.
   c. Seal with sealant specified by vent pipe manufacturer, using ⅜" bead (not required for FasN-Seal™).
   d. Tighten strap at band clamp screw until strap is snug around blower housing.

Figure 8 FasNSeal™ vent starter

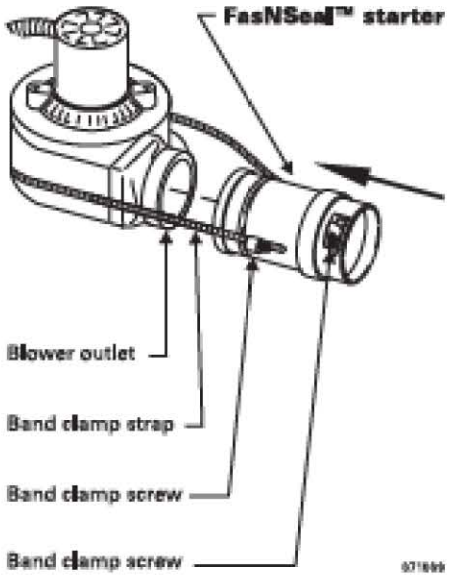


Figure 9 Z-Vent II vent starter

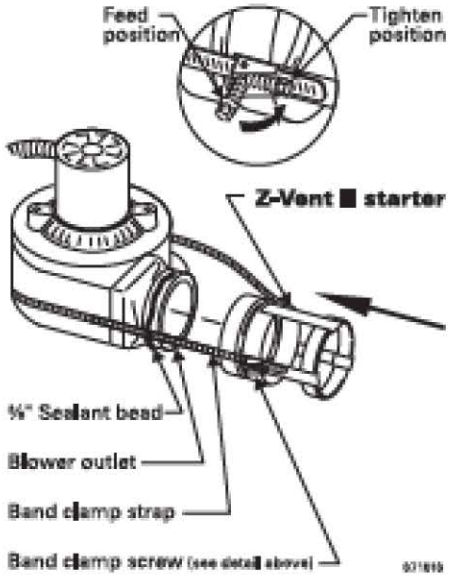


Figure 10 Saf-T Vent® vent starter

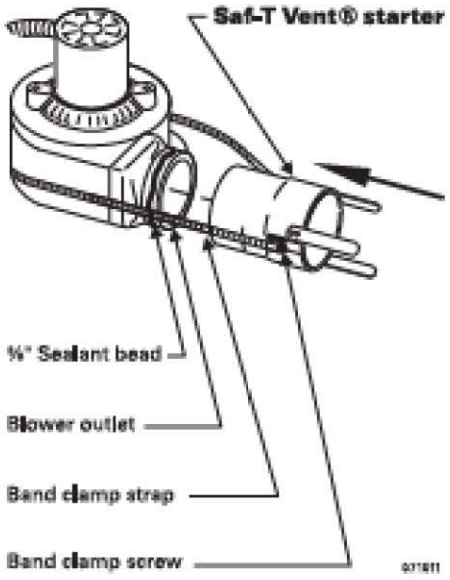
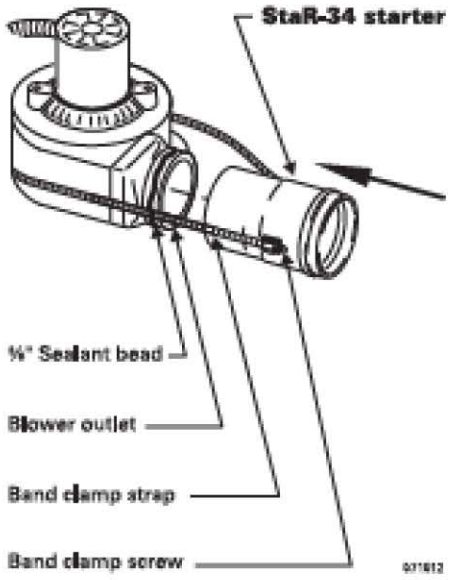


Figure 11 StaR-34 vent starter



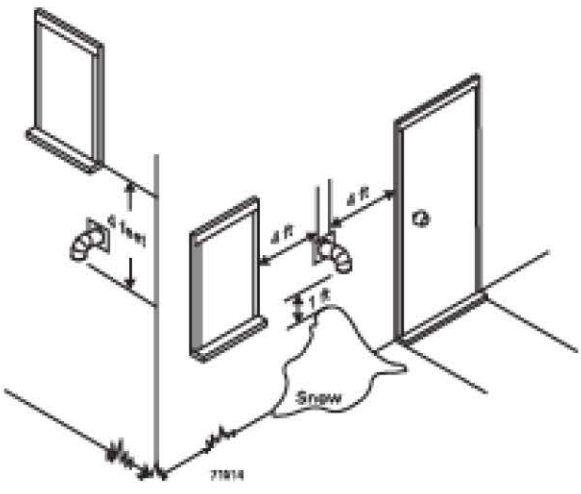
3e Venting — direct exhaust — termination

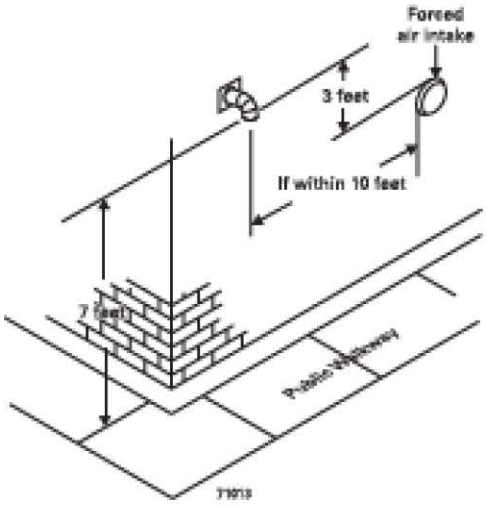
⚠WARNING Follow instructions on this page when determining vent location to avoid possibility of severe personal injury, death or substantial property damage.

1. Locate the boiler and vent penetration through the wall so all requirements on this page and in **Figure 12** will be met. Also follow vent manufacturer's instructions.
2. Gases will form white plume in winter. Plume could obstruct window view.
3. Prevailing winds could cause freezing of condensate and water/ice buildup on vent termination, building, plants or roof. Ice buildup on vent termination can cause boiler shutdown and building freezeup.
4. Winds over 40 mph can cause nuisance boiler shutdown if boiler is sidewall vented. This could result in loss of heat to building, causing freezeup.
5. Locate or guard vent termination to prevent condensate from damaging exterior surfaces.
6. Locate the vent termination well away from trees, shrubs, and decorative items.
7. Locate or guard vent to prevent accidental contact by people or pets.
8. Do not terminate vent in window well, stairwell, alcove, courtyard, or other recessed areas.
9. Do not wrap or insulate vent pipe or fittings.
10. Do not terminate vent above any door or window. Condensate can freeze, causing ice formations.
11. Do not connect:
    - Any other appliance to vent pipe.
    - Multiple boilers to a common vent pipe.
12. Canadian installations — See B149.1 or B149.2 Installation Code. Terminate vent no less than 6 feet from another combustion air inlet, 3 feet from any other building opening, and 3 feet from any gas service regulator.
13. See **Figure 12**, showing that the vent must terminate:
    - more than 4 feet below or to side of all doors or windows.
    - more than 1 foot above grade or anticipated snow line.
    - at least 7 feet above public walkway.
    - 3 feet above any forced air intake within 10 feet.
14. Vent must also terminate:
    - at least 6 feet away from adjacent walls.
    - no closer than 5 feet below roof overhang.
    - at least 4 feet horizontally (and in no case above or below unless a 4 foot horizontal distance is maintained) from electric meters, gas meters, regulators, relief valves, and other equipment.
15. Site conditions may dictate greater clearances.
16. Do not extend exposed vent pipe outside of building. Condensate could freeze and block vent pipe.

⚠WARNING A gas vent extending through an exterior wall shall not terminate adjacent to the wall or below building extensions such as eaves, parapets, balconies or decks. Failure to comply could result in severe personal injury, death or substantial property damage.

Figure 12 Vent termination minimum clearances





3f Venting – direct exhaust – vertical or sidewall

1. Do not mix types or manufacturers of vent materials.
2. Clean all joints before sealing. See vent manufacturer's instructions for cleaning and sealing joints. Use their specified sealant. Do not use screws.
3. Install vent pipe with seams on top of vent horizontal runs. Follow requirements in Section 3e, page 17, for vent termination.
4. Maintain minimum 2" clearance from combustible materials to vent pipe.
5. **Vertical venting** — See Figure 13. Follow vent manufacturer's instructions for venting through roof.
   - Vent pipe must extend through roof flashing, jacket or thimble.
   - Vent may pass through floor, inside wall or concealed space when installed according to vent manufacturer's instructions.

   Sidewall venting — See Figures 14 and 15. Vent must terminate at least one foot above anticipated snowline. Vent must be terminated only with:
   - Tee or elbow with integral screen. Tee must be mounted vertically.
   - Elbow and termination coupling with screen (not available for StaR-34).
6. Do not seal vent pipe (slip connector for Saf-T Vent) to inside or outside plate.
7. If passing through noncombustible wall, provide hole diameter large enough to insert the vent pipe (slip connector for Saf-T Vent).
8. Install horizontal drain tee as close as possible to boiler, in first horizontal run. See Figure 13.
9. Do not exceed the maximum vent system length given in Table 4, page 15.

⚠WARNING

Condensate drain line — use only silicone tubing rated for at least 400°F for the condensate drain line. Using any other material could cause flue gas leakage, potentially resulting in severe personal injury, death or substantial property damage.

⚠CAUTION

On some installations, the condensate drain fitting may be omitted, provided:

- Vent manufacturer shows this option in their instructions.
- Vent is sloped toward termination as shown in dotted lines in Figure 14.
- The vent is installed per Weil-McLain and vent manufacturer's instructions.

Condensate drippage from such vents may accumulate on the ground below. Consider traffic in the area to avoid hazard due to ice accumulation. Ice buildup may also block vent.

Figure 13 Direct exhaust vertical venting

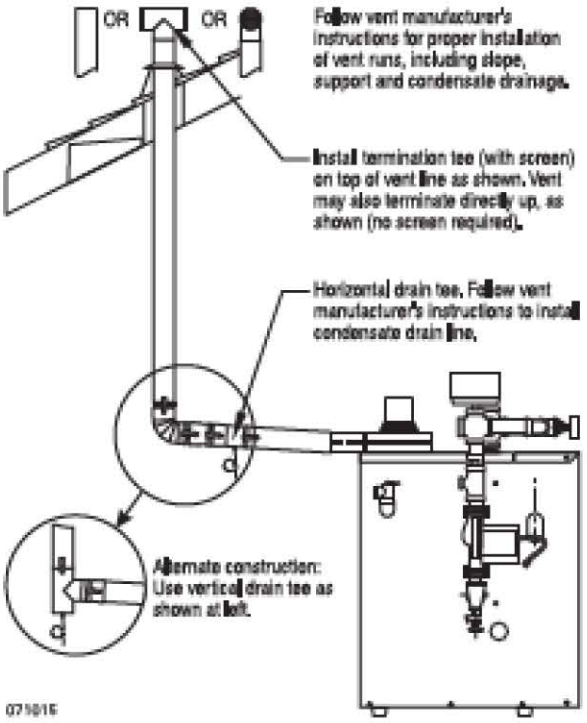
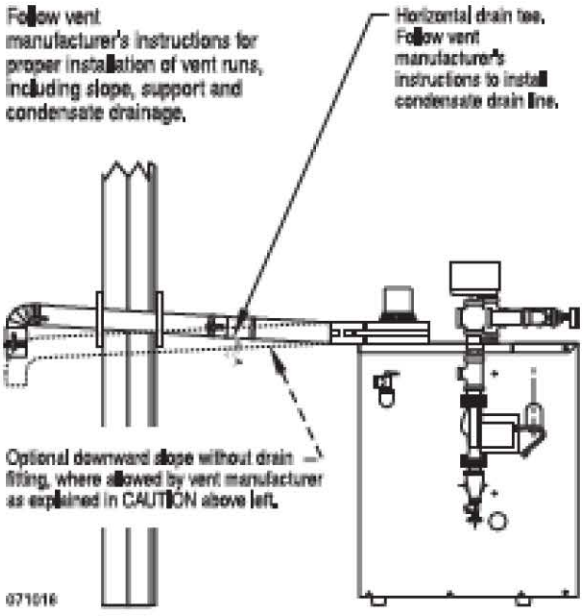

OR
OR
Follow vent manufacturer's instructions for proper installation of vent runs, including slope, support and condensate drainage.
Install termination tee (with screen) on top of vent line as shown. Vent may also terminate directly up, as shown (no screen required).
Horizontal drain tee. Follow vent manufacturer's instructions to install condensate drain line.
Alternate construction: Use vertical drain tee as shown at left.
071016

Figure 14 Direct exhaust sidewall venting


Follow vent manufacturer's instructions for proper installation of vent runs, including slope, support and condensate drainage.
Horizontal drain tee. Follow vent manufacturer's instructions to install condensate drain line.
Optional downward slope without drain fitting, where allowed by vent manufacturer as explained in CAUTION above left.
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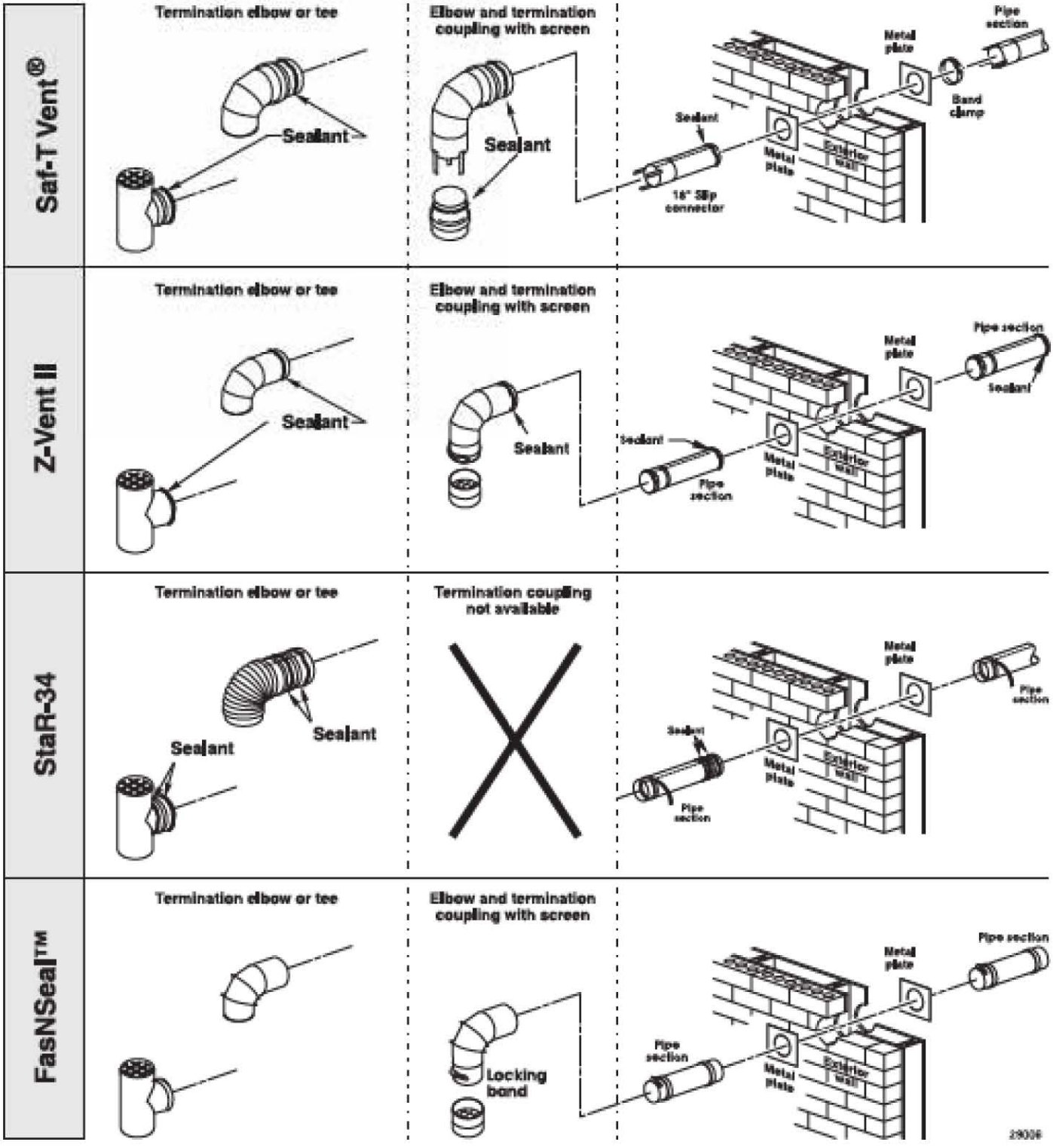
⚠WARNING Using any termination other than one of those shown could cause nuisance outages and loss of heat, resulting in substantial property damage.

Figure 15 Sidewall termination



4a Water piping — general information

General piping information

If installation is to comply with ASME or Canadian requirements, an additional **high temperature limit** is needed. Install control in supply piping between boiler and isolation valve. Set second control to minimum 20°F above setpoint of first control. Maximum allowable setpoint is 240°F. See Section **9b** for wiring.

A **low water cutoff device** is required when boiler is installed above radiation level or by certain state or local codes or insurance companies. Use low water cutoff designed for water installations. Electrode probe-type is recommended. Purchase and install in tee in supply piping above boiler.

Use **backflow check valve** in cold water supply as required by local codes.

If boiler is installed in a closet, it is recommended to insulate the boiler piping in the closet to lower the closet air temperature.

Pressure/temperature gauge

Install pressure/temperature gauge in the tee on the supply piping (as shown in drawing on page 3).

Relief valve

Install relief valve vertically in ¾" tapping on side of boiler. See **Figure 16**, page 21, and the tag attached to the relief valve for manufacturer's instructions.

Circulator and 3-way valve

1. See page 64, Figure 39.
2. Apply pipe dope to fittings and install in boiler supply and return tappings in the order shown in Figure 39.
3. Install circulator, flanges and gaskets.
4. Complete by soldering copper fittings and 3-way valve in the order shown in Figure 39.
5. Pull 3-way valve Molex and harness through jacket top left conduit opening.
6. Insert Molex connector into mating connector on 3-way valve. Make sure that valve body is in correct position as shown in Figure 39.

The circulator is shipped loose (wiring pre-attached to boiler). Pipe the circulator on the return line only, as shown on page 3 and page 64. Pipe the expansion tank to the suction side of the circulator as shown in Figure 16, page 21. Install an air separator in the supply piping. Always install the system fill connection at the same point as the expansion tank connection to the system. Figure 16 shows typical near-boiler piping connections.

⚠WARNING To avoid water damage or scalding due to relief valve operation:

- Discharge line must be connected to relief valve outlet and **run to a safe place of disposal.** Terminate the discharge line to eliminate possibility of severe burns should the valve discharge.
- Discharge line must be as short as possible and be the **same size as the valve discharge connection** throughout its entire length.
- Discharge line must **pitch downward** from the valve and terminate at least 6" above the floor drain where any discharge will be clearly visible.
- The discharge line shall **terminate plain, not threaded,** with a material serviceable for temperatures of 375°F or greater.
- **Do not pipe the discharge to any place where freezing could occur.**
- **No shutoff valve** shall be installed between the relief valve and boiler, or in the discharge line. Do not plug or place any obstruction in the discharge line.
- **Failure to comply** with the above guidelines could result in failure of the relief valve to operate, resulting in possibility of severe personal injury, death or substantial property damage.
- **Test the operation of the valve** after filling and pressurizing system by lifting the lever. Make sure the valve discharges freely. If the valve fails to operate correctly, replace it with a new relief valve.

4b Water piping — system

System water piping

See **Figure 16** and **Table 5** for near-boiler piping and piping for single-zone systems designed for return water at least 130°F.

See pages 22-23 to for multiple-zone piping for systems with return water tempeature of at least 130°F. See pages 24-25 for low-temperature system piping; i.e., radiant heating systems or converted gravity systems (large-volume systems originally designed for circulation by natural convection rather than a pump).

Table 5 Water pipe size (based on 20°F rise)

Boiler model number	To system	From system
CGt	1"	1"
Note: The following connections (supplied with the boiler) are 1¼" NPT. — Boiler supply and return tappings; drain tee; supply tee; circulator suction-side flange. The following connections (supplied with the boiler) are 1"NPT. — Circulator discharge-side flange; 3-way valve and its connected pipe fitting.		

⚠WARNING **Chillers or air handling units:** Install boiler such that —

- Chilled medium, if used, is piped in parallel with heating boiler. Use appropriate valves to prevent chilled medium from entering boiler. Consult I=B=R Installation and Piping Guides.
- If boiler is connected to heating coils located in air handling units where they can be exposed to refrigerated air, use flow control valves or other automatic means to prevent gravity circulation during cooling cycle. Circulation of cold water through the boiler could result in damage to the heat exchanger, causing possible severe personal injury, death or substantial property damage.

Expansion tank

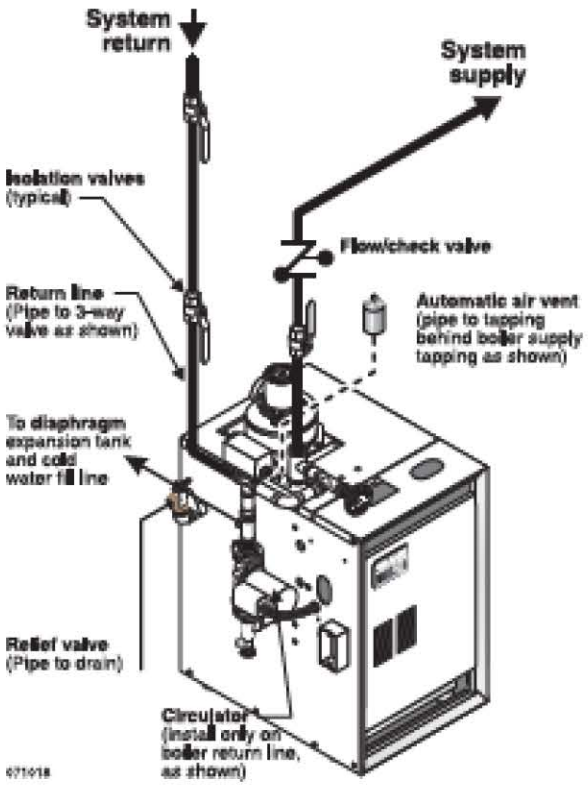
⚠CAUTION The piping of the CGt boiler requires the use of a bladder-type or diaphragm-type expansion tank. Use of a closed-type tank is not recommended.

⚠CAUTION Undersized expansion tanks cause system water to be lost from relief valve and makeup water to be added through fill valve. Eventual section failure can result.

1. Ensure expansion tank size will handle boiler and system water volume and temperature. Tank must be located in boiler return piping as close to boiler as possible, before inlet side of circulator. See tank manufacturer's instructions for details.
2. Install an **automatic air vent** as shown.

⚠WARNING Use **Figure 16** only for single-zone systems designed for return water at least 130°F. For systems with low return water temperature possible, such as converted gravity systems and radiant heating systems, refer to the special piping suggestions of pages 24-25. Failure to prevent low return water temperature to the boiler could cause corrosion of the boiler sections or burners, resulting in severe personal injury, death or substantial property damage.

Figure 16 Piping to single-zone system using diaphragm-type or bladder-type expansion tank. See Table 5 for piping sizes.


System return
System supply
Isolation valves (typical)
Flow/check valve
Return line (Pipe to 3-way valve as shown)
Automatic air vent (pipe to tapping behind boiler supply tapping as shown)
To diaphragm expansion tank and cold water fill line
Relief valve (Pipe to drain)
Circulator (install only on boiler return line, as shown)
071018

4c Water piping — multiple zones

Piping multiple zones

Follow instructions on pages 20 and 21 to install near-boiler piping or for single-zone systems. (Also see **"Piping for radiant heating systems or converted gravity systems"** if applicable.)

See **Figure 18** or **Figure 19**, page 23, to complete installation.

Zoning with circulators (Figure 18) (return temp over 130°F)

1. Size each circulator to individual circuit requirements.
2. Do not install circulator on boiler (except for primary/secondary bypass piping).
3. Install isolation (balancing) valves to adjust flow to distribute heat to all zones.
4. Install and wire a separate relay for each zone circulator.

Zoning with zone valves (Figure 19) (return temp over 130°F)

1. Install isolation (balancing) valves to adjust flow to distribute heat to all zones.
2. Provide a separate 24-volt transformer to power the zone valves. Size the transformer to handle the total rated load of all connected zone valves.

Piping for radiant heating systems or converted gravity systems

⚠WARNING Failure to prevent low return water temperature to the boiler could cause corrosion of the boiler sections or burners, resulting in severe personal injury, death or substantial property damage.

Converted gravity (or steam) systems

Whenever possible, use the primary/secondary bypass piping shown in **Figures 20** or **21** on page 25. This piping design allows changing boiler flow rate without affecting primary circuit flow rate.

Radiant heating systems

Preferably, use primary/secondary bypass piping, as shown in **Figures 20** or **21** on page 25.

If radiant system tubing has no oxygen barrier, a **heat exchanger** must be used.

⚠WARNING Radiant heating system piping should include a means of regulating the boiler return water temperature and the system supply temperature (such as provided by an injection pumping control). Boiler return water temperature will be adequately controlled using the methods shown in this manual provided the system supply temperature is relatively constant.

DO NOT apply the methods in this manual if the system is equipped with an **outdoor reset control**. Instead, provide controls and piping which can regulate the boiler return water temperature at no less than 130°F regardless of system supply temperature. Contact your Weil-McLain representative for suggested piping and control methods. Failure to prevent cold return water temperature to the boiler could cause corrosion damage to the sections or burners, resulting in possible severe personal injury, death or substantial property damage.

4c Water piping — multiple zones (continued)

Figure 18 Zoning with circulators — return water 130°F or higher.

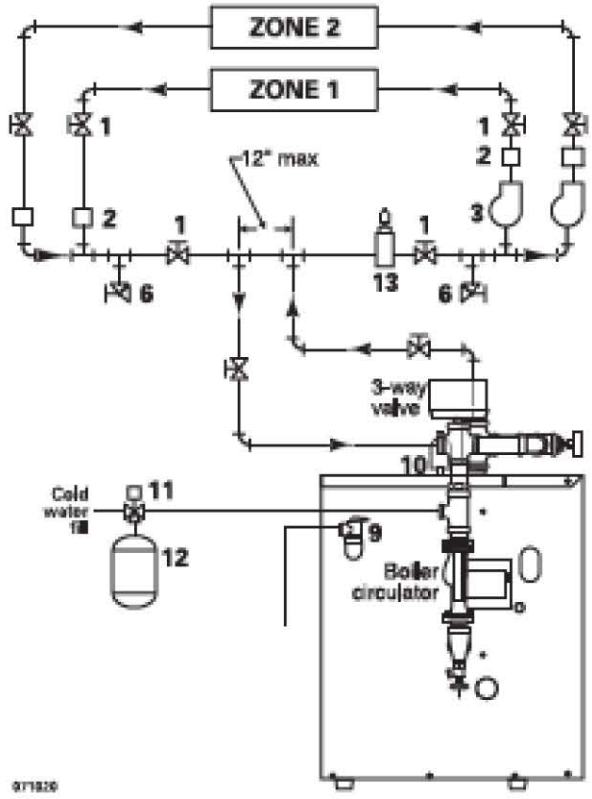
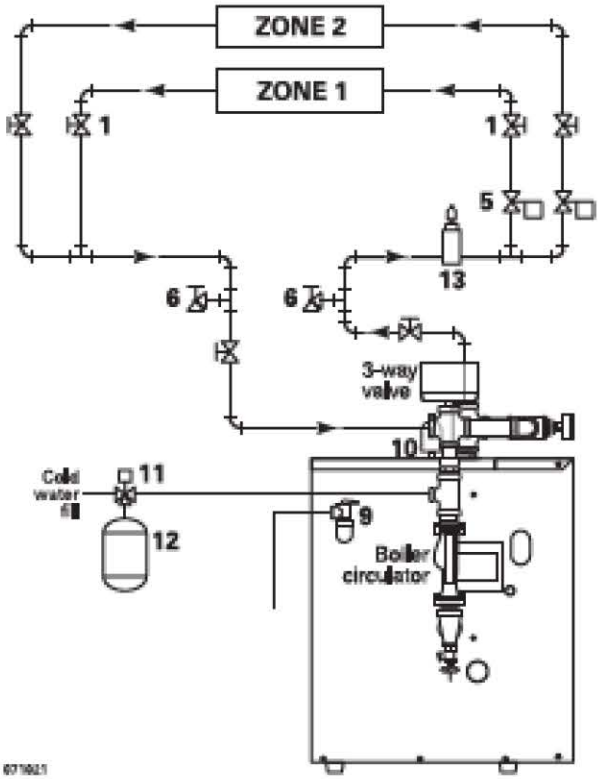


Figure 19 Zoning with zone valves — return water 130°F or higher.



1 Boiler isolation (balancing) valves

2 Flow/check valve

3 System or zone circulator

5 Zone valve

6 Drain valve

9 Relief valve

10 Automatic air vent (with diaphragm-type expansion tank), or connect to tank fitting (closed-type expansion tank). **DO NOT** use an automatic air vent when using closed-type expansion tank. It would allow air to leave the system, causing waterlogging of the expansion tank.

11 Fill valve

12 Diaphragm-type or bladder-type expansion tank

13 Air separator with automatic vent, if used (Note that the fill valve must always be connected to the expansion tank.)

⚠WARNING For systems with possible **low return-water temperature** (such as converted gravity systems, radiant heating systems and heat pump systems), refer to the special piping suggestions of Figures 20 – 21, page 25, as applies. Failure to prevent sustained low return water temperature to the boiler could cause corrosion of the boiler sections, resulting in severe personal injury, death or substantial property damage.

4d Piping — low temperature systems

Bypass piping

Figures 20 and 21, page 25, show suggested bypass arrangements using bypass piping for low temperature systems such as **radiant heating systems** or **converted gravity systems.**

Primary/secondary bypass piping is required because the boiler circulator must install on the return line and be used to provide domestic water priority. Adjustment of the bypass valves in the boiler circuit will not cause a change in the heating circuit flow rate or temperature distribution.

The bypass valves in **Figures 20** and **21** (items **7a** and **7b**) provide mixing of hot boiler outlet water with cooler system return water — set to assure a minimum return water temperature (at least 130°F) to the boiler. Set the valves as explained below.

Temperature gauges

- **Gauge 4a** is suggested, but optional on any system.
- **Gauge 4b** is optional on converted gravity systems, but **required** on radiant heating systems — to display the water temperature being supplied to the radiant tubing.
- **Gauge 8** is **required** on all systems to assure the return water temperature is accurately set for a minimum of 130°F. If this gauge is not available however, adjust the valves such that the boiler-mounted temperature/pressure gauge reads at least 150°F when the system return water is cold (approximately 60°F water temperature).

Valve adjustment (Figures 20 and 21 only)

1. Set the valves while the system is cool, setting for the coldest expected water temperature (usually 60°F since the system will often drop to room temperature between cycles).
2. Start with valve **7a** fully closed and **7b** fully open.
3. Gradually open valve **7a** while closing valve **7b** until the temperature at gauge **8** reads 130°F when gauge **4a** reads 60°F.
4. Note that valve **7a** regulates the amount of hot water from the boiler supply which mixes with return water. Valve **7b** regulates the amount of system water flowing through the boiler secondary loop.

⚠WARNING

Failure to **prevent low return water temperature** to the boiler could cause corrosion of the boiler sections or burners, resulting in severe personal injury, death or substantial property damage.

Radiant heating system piping should include a means of **regulating the boiler return water temperature** and the **system supply temperature** (such as provided by an **injection pumping control**).

Boiler return water temperature will be adequately controlled using the methods shown in this manual provided the **system supply temperature** is **relatively constant.**

DO NOT apply the methods of this manual if the system is equipped with an **outdoor reset control.** Instead, **provide controls and piping** which can **regulate the boiler return water temperature** at **no less than 130°F** regardless of system supply temperature. Contact your Weil-McLain representative for suggested piping and control methods.

Failure to **prevent cold return water temperature** to the boiler could cause corrosion damage to the sections or burners, resulting in possible severe personal injury, death or substantial property damage.

4d Piping — low temperature systems (continued)

Figure 20 By-pass piping
Zoning with circulators

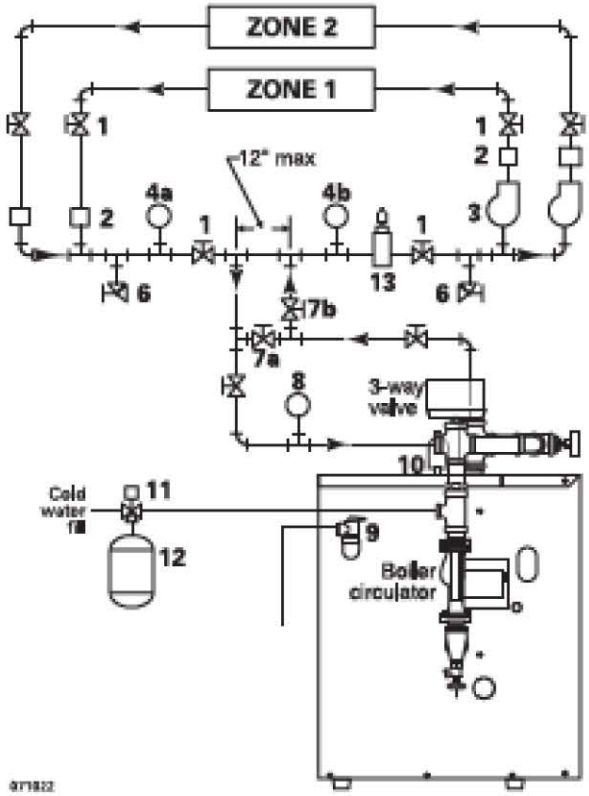
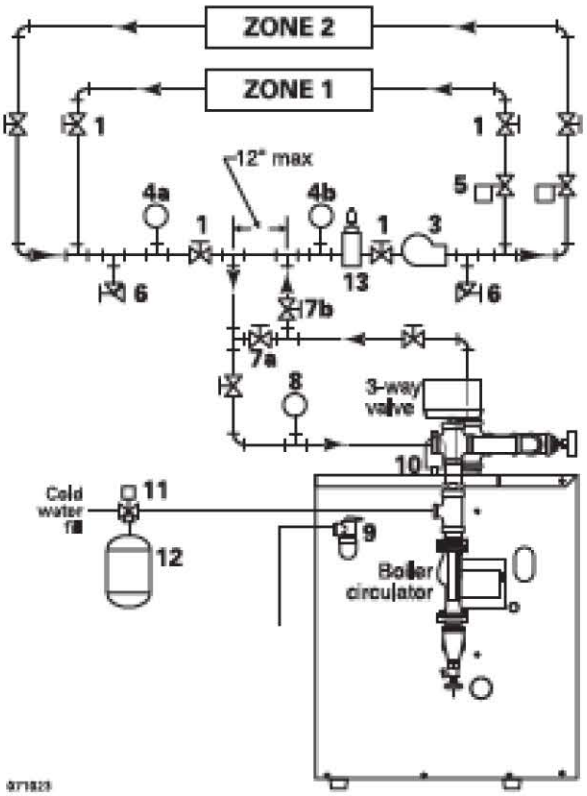


Figure 21 By-pass piping
Zoning with zone valves



1 Boiler isolation (balancing) valves

2 Flow/check valve

3 System or zone circulator

4 System temperature gauges

5 Zone valve

6 Drain valve

7 System temperature valves (see instructions on page 24 for adjusting valves)

8 Blend temperature gauge

9 Relief valve

10 Automatic air vent

11 Fill valve

12 Diaphragm-type or bladder-type expansion tank, if used

13 Air separator and automatic vent, if used (Note that the fill valve must always be connected to the expansion tank, at item 11.)

4e Water piping — connect tankless heater

Hot Water Can Scald!

- Consumer Product Safety Commission and some states recommend domestic hot water temperature of 130°F or less.
- When installing an automatic mixing valve, selection and installation must comply with valve manufacturer's recommendations and instructions.
- Water heated to a temperature suitable for clothes washing, dish washing and other sanitizing needs will scaled and cause injury
- Children, elderly, infirm or physically handicapped persons are more likely to be injured by hot water. Never leave them unattended in or near a bathtub, shower or sink. Never allow small children to use a hot water faucet or draw their own bath. If anyone using hot water in the building fits this description, or if state laws or local codes require certain water temperatures at hot water faucets, take special precautions:
- Install automatic mixing valve set according to those standards.
- Use lowest practical temperature setting.
- Check water temperature immediately after first heating cycle and after any adjustment.

Protection Must Be Taken Against Excessive Temperature and Pressure! — Installation of a Temperature & Pressure (T&P) relief valve is required.

To pipe tankless heater:

1. Size piping no smaller than tankless heater inlet and outlet.
2. The following controls (furnished by others) must be installed:
   a. Automatic mixing valve see **Figure** 22. See **DANGER** above.
   b. Flow regulating valve. Size according to intermittent draw of tankless heater. See **Table** 6. Follow valve manufacturer's instructions to install.
3. Additional anti-scald devices may be installed at each hot water faucet, bath and shower outlet.
4. In hard water areas, soften cold domestic supply water to heaters to prevent lime build-up.

To set tankless heater low limit:

1. Adjust setpoint dial to 190°F - 200°F. The boiler high limit should be set 20°F higher.

⚠WARNING Studies have indicated that dangerous bacteria can form in potable water distribution system if certain minimum water temperatures are not maintained. Contact local health department for more information.

NOTICE These single wall heat exchangers comply with National Standard Plumbing Code provided that:

- Boiler water (including additives) is practically non-toxic, having a toxicity rating or class of 1, as listed in Clinical Toxicology of Commercial Products.
- Boiler water pressure is limited to maximum 30 psig by approved water relief valve.

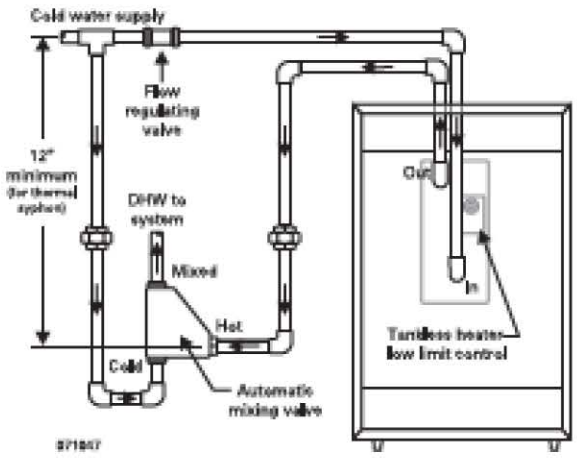
NOTICE If boiler is installed in a closet, it is recommended to insulate the supply piping of domestic hot water to lower closet air temperature.

Table 6 Tankless heater rating table

Boiler model number	Heater number	Intermittent draw ratings (GPM) Note 1	Inlet and outlet tapping sizes
CGt	550-921-920	2.6	3/4"

Note 1: Gallons of water per minute heated from 40°F to 140°F with 200°F boiler water temperature. Tested in accordance with I=W=H Testing and Rating Standard for Indirect Tankless Water Heaters Tested with Boilers.

Figure 22 Tankless heater piping



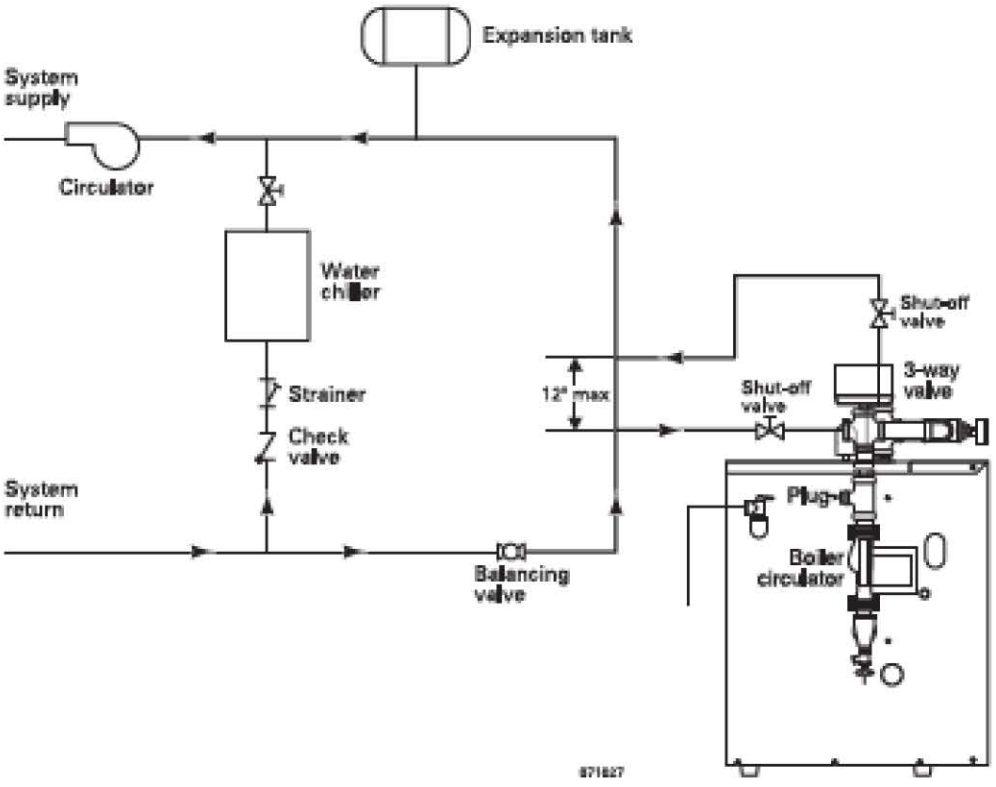
4f Water piping — refrigeration systems

Prevent chilled water from entering boiler

Install boiler so that chilled medium is piped in parallel with the heating boiler. Use appropriate valves to prevent chilled medium from entering boiler. See **Figure 23** for typical installation of balancing valve and check valve.

If boiler is connected to heating coils located in air handling units where they can be exposed to refrigerated air, use flow control valves or other automatic means to prevent gravity circulation during cooling cycle.

Figure 23 Piping refrigeration systems



5 Gas piping

Connecting gas supply piping to boiler

1. Remove jacket front panel and refer to **Figure 24** to pipe gas to boiler.
   a. **Install drip leg** at inlet of gas connection to boiler. Where local utility requires drip leg to be extended to the floor, use appropriate length of pipe between cap and tee.
   b. **Install ground joint union** for servicing, when required.
   c. **Install manual shutoff valve** in gas supply piping outside boiler jacket when required by local codes or utility requirements.
   d. **In Canada** — When using manual main shutoff valve, it **must be identified** by the installer.
2. **Support piping** with hangers, not by boiler or its accessories.
3. **Purge all air** from gas supply piping.
4. Before placing boiler in operation, **check boiler and its gas connection for leaks.**
   a. **Close manual main shutoff valve** during any pressure testing at less than 13" w.c.
   b. **Disconnect boiler and gas valve from gas supply piping** during any pressure testing greater than 13" w.c.

⚠WARNING **Do not check for gas leaks with an open flame** — use bubble test. Failure to use bubble test or check for gas leaks can cause severe personal injury, death or substantial property damage.

5. **Use pipe dope compatible with propane gases.** Apply sparingly only to male threads of pipe joints so that pipe dope does not block gas flow.

⚠WARNING **Failure to apply pipe dope** as detailed above can result in severe personal injury, death or substantial property damage.

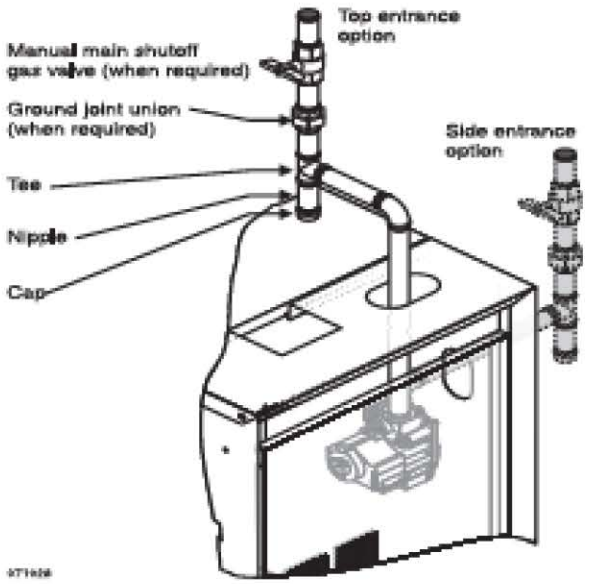
Sizing gas supply piping

1. Refer to **Table 7** for pipe length and diameter. Base on rated boiler input (divide by 1,000 to obtain cubic feet per hour). **Table 7** is only for gas with **specific gravity 0.60, with a pressure drop through the gas piping of 0.30" w.c.** For additional gas pipe sizing information, refer to ANSI Z223.1 (or B149.1 or B149.2 for Canadian installations).
2. Inlet pressure required at gas valve inlet:
   - Maximum: 13" w.c.
   - Minimum: 5" w.c.
   - Manifold gas pressure: 3.5" w.c.
3. Install 100% lockup gas pressure regulator in supply line **if inlet pressure exceeds 13" w.c.** Adjust for 13" w.c. maximum.

Table 7 Pipe capacity for 0.60 specific gravity natural gas

Gas pipe length (feet)	Capacity of pipe for pipe size of: (Capacity in cubic feet gas per hour)				
	½"	¾"	1"	1¼"	1½"
10	132	278	520	1050	1600
20	92	190	350	730	1100
30	73	152	285	590	860
40	63	130	245	500	760
50	56	115	215	440	670
75	45	93	175	360	545
100	38	79	150	305	460
150	31	64	120	250	380

Figure 24 Gas supply piping



6 Field wiring

⚠WARNING For your safety, **turn off electrical power supply at service entrance panel before making any electrical connections** to avoid possible electric shock hazard. Failure to do so can cause severe personal injury or death.

NOTICE **Wiring must be N.E.C. Class 1.**

If original rollout thermal fuse element wire as supplied with boiler must be replaced, use only type **200°C** wire or equivalent. If other original wiring as supplied with boiler must be replaced, type **105°C** wire or equivalent must be used.

Boiler must be **electrically grounded** as required by National Electrical Code ANSI/NFPA 70–latest edition.

Electrical installation must comply with:

1. National Electrical Code and any other national, state, provincial or local codes or regulations.
2. In Canada, CSA C22.1 Canadian Electrical Code Part 1, and any local codes.

Wiring connections

Boiler is shipped with controls completely wired. You must connect the **ambient temperature switch** wires (page 3, item 10) to the switch after the boiler is in place. See page 6 for switch location and mounting. The factory-supplied wires are 4-feet long. Splice additional wire if needed.

Thermostat

1. Connect thermostat as shown on wiring diagram on boiler.
2. **Install on inside wall away from influences of drafts, hot or cold water pipes, lighting fixtures, television, sunrays, or fireplaces.**
3. If thermostat has a heat anticipator, set heat anticipator in thermostat to match power requirements of equipment connected to it. If connected directly to boiler, set for 0.1 amps plus gas valve current. See information on wiring diagram as shown in **Figure 29**, page 35. For other devices, refer to manufacturer's specifications. Wiring diagram on boiler gives setting for control module and gas valve. Also see instructions with thermostat.

Junction Box (furnished)

1. Connect 120 VAC power wiring as shown in **Figure 25.**
2. Fused disconnect or service switch (15 amp. recommended) may be mounted on this box. For those installations with local codes which prohibit installation of fused disconnect or service switch on boiler, install a 2 x 4 cover plate on the boiler junction box and mount the service switch remotely as required by the code.

NOTICE The CGt control module is polarity-sensitive. The hot and neutral wires must be connected to the correct leads. A flashing **POWER** light usually indicates reversed polarity of 120 VAC lead wires.

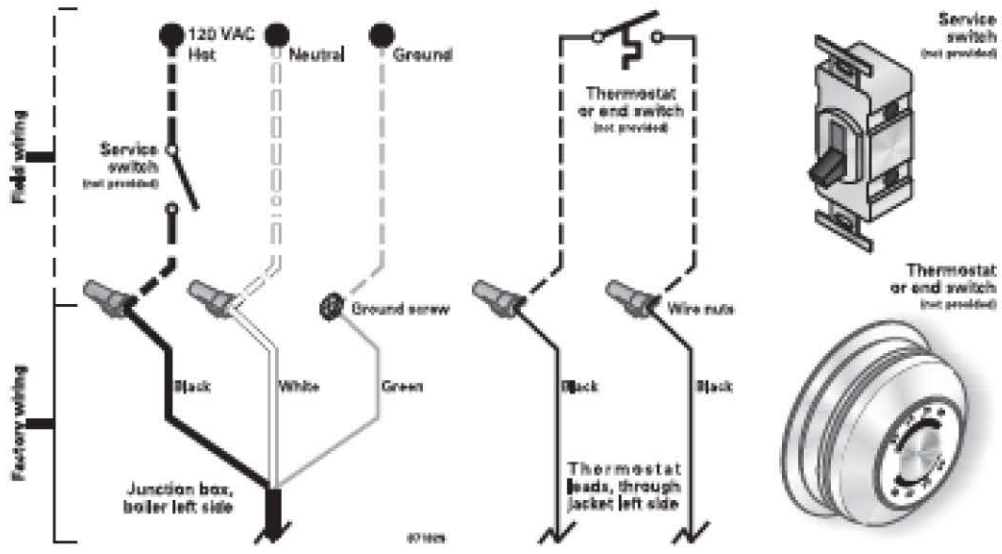


Figure 25
Field wiring connections — service switch and thermostat (or end switch) provided by installer

7a Start-up — preparation

Check for gas leaks

⚠WARNING Before starting the boiler, and during initial operation, smell near the floor and around the boiler for gas odorant or any unusual odor. Do not proceed with start-up if there is any indication of a gas leak. Repair any leak at once.

Determine if water treatment is needed

⚠ DANGER Do not use **petroleum-based cleaning or sealing compounds** in boiler system. Severe damage to boiler will occur, resulting in substantial property damage.

⚠WARNING Eliminate all system leaks. Continual fresh makeup water will reduce boiler life. Minerals can build up in sections, reducing heat transfer, overheating cast iron, and causing section failure.

Verify water chemistry

Consult local water treatment companies for unusually hard water areas (above 7 grains hardness) or low pH water conditions (below 7.0). Boiler water pH of 7.0 to 8.5 is recommended.

Freeze protection (when used)

Use antifreeze made especially for hydronic systems. Inhibited propylene glycol is recommended.

⚠WARNING Do not use **ethylene glycol, automotive or undiluted antifreeze.** Severe personal injury or death can result.

1. Determine **antifreeze quantity** according to system water content. Boiler water content is listed on page 67. Remember to include expansion tank water content.
2. Follow antifreeze manufacturer's instructions.
3. A 50% solution of propylene glycol/water provides maximum protection to about -30°F.
4. Local codes may require **back flow preventer** or actual disconnect from city water supply.
5. When using antifreeze in a system with automatic fill, install a water meter to monitor water makeup. Glycol will leak before the water begins to leak, causing glycol level to drop. Added water will dilute the antifreeze, reducing the freeze protection level.

Fill the system with water

1. Close manual and automatic **air vents** and boiler drain cock.
2. **Fill to correct system pressure.** Correct pressure will vary with each application. Typical cold water fill pressure for a residential system is 12 psi.
3. **Purge air** from system:
   a. Connect a hose to the purge valve (see *drain valves*, item 6, in suggested piping diagrams on pages 23 through 25, **Figures 18** through **Figure 21**). Route hose to an area where water can drain and be seen.
   b. Close the boiler or system isolation valve between the purge valve and fill connection to the system.
   c. Close zone isolation valves.
   d. Open quick-fill valve on cold water makeup line.
   e. Open purge valve.
   f. One zone at a time, open the isolation valves. Allow water to run through the zone, pushing out the air. Run until no noticeable air flow is present. Close the zone isolation valves and proceed with the next zone. Follow this procedure until all zones are purged.
   g. Close the quick-fill water valve and purge valve and remove the hose. Open all isolation valves. Watch that system pressure rises to correct cold-fill pressure.
   h. After the system has operated for a while, eliminate any residual air by using the manual air vents located throughout the system.
   i. If purge valves are not installed in system, open manual air vents in system one at a time, beginning with lowest floor. Close vent when water squirts out. Repeat with remaining vents.
4. Open **automatic air vent** (diaphragm-type or bladder-type expansion tank systems only) one turn.
5. Open other vents:
   a. Starting on the lowest floor, open air vents one at a time until water squirts out.
   b. Repeat with remaining vents.
   6. Refill to correct pressure.

7a Start-up — preparation (continued)

Inspect system water piping

After filling the boiler and system with water, **inspect all piping** throughout the system for leaks. If found, repair immediately. Repeat this inspection after the boiler has been started and the system has heated up.

⚠WARNING **Leaks must be repaired at once.** Failure to do so can damage the boiler, resulting in substantial property damage.

⚠ DANGER Do not use **petroleum-based cleaning or sealing compounds** in boiler system. Severe damage to boiler will occur, resulting in substantial property damage.

Inspect base insulation

⚠WARNING The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on **page 68** of this manual. Failure to comply could result in severe personal injury.

Check to make sure **insulation is secure** against all four sides of the base. If insulation is damaged or displaced, **do not** operate boiler. Replace or reposition insulation.

⚠WARNING **Failure to replace** damaged insulation or reposition insulation can result in a fire hazard, causing severe personal injury, death or substantial property damage.

7b Start-up — operate boiler

Final check before starting boiler

- Read manual Section **9**, including the **Operating Instructions** (Section **9c**).
- Verify the boiler and system are **full of water.**
- Verify the **Start-up preparation** procedures of Section **7a** have been completed.

Start the boiler

- Follow the **Operating Instructions** from Section **9c** to start the boiler.
- See Section **7c** if boiler fails to start.

Check system and boiler

1. **Check system piping and domestic hot water piping for leaks.** If found, shut down boiler and repair immediately.
2. **Vent air from system** using manual vents. Air in the system will interfere with circulation and cause heat distribution problems and noise.
3. **Inspect vent system** thoroughly for signs of deterioration from corrosion, physical damage or sagging. In addition — Check for gas-tight seal at every connection and seam.
4. **Check around the boiler** for gas odor following the procedure of Section **7a** of this manual.
5. **Verify operation** per Section **7b.** Perform check-out procedure in Section **8**, and fill in the **Installation and service certificate** on the same page.

⚠ DANGER Do not use **petroleum-based cleaning or sealing compounds** in boiler system. Severe damage to boiler will occur, resulting in substantial property damage.

⚠WARNING **Eliminate all system leaks.** Continual fresh makeup water will reduce boiler life. Minerals can build up in sections, reducing heat transfer, overheating cast iron, and causing section failure.

⚠WARNING Glycol or antifreeze leaks around the boiler may result in fire, causing severe personal injury, death or substantial property damage.

⚠WARNING **Venting system must be sealed gas-tight** to prevent flue gas spillage and carbon monoxide emissions which will result in severe personal injury or death.

⚠WARNING If you discover evidence of any gas leak, shut down the boiler at once. Find the leak source with bubble test and repair immediately. Do not start boiler again until corrected. Failure to comply could result in severe personal injury, death or substantial property damage.

7b Start-up — operate boiler (continued)

Check burner flames

View pilot and main flames through the inspection port in the base burner shield.

Pilot burner flame (Figure 26)

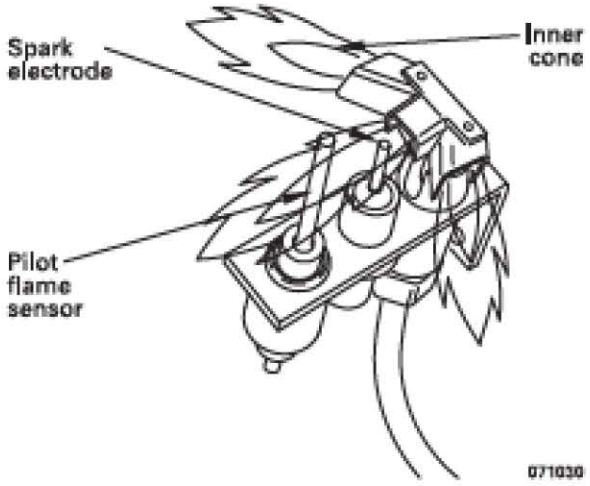
PROPER pilot flame characteristics:

1. Blue flame.
2. Inner cone engulfing pilot flame sensor.
3. Pilot flame sensor glowing cherry red.

IMPROPER pilot flame characteristics:

1. Overfired — Large flame lifting or blowing past pilot flame sensor.
2. Underfired — Small flame. Inner cone not engulfing pilot flame sensor.
3. Lack of primary air — Yellow flame tip.
4. Incorrectly heated pilot flame sensor.

Figure 26 Typical pilot burner flame



Main burner flame (Figure 27)

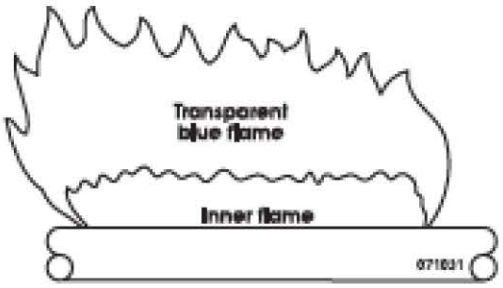
PROPER main burner flame characteristics:

1. Yellow-orange streaks may appear (caused by dust).

IMPROPER main burner flame characteristics:

1. Overfired — Large flames.
2. Underfired — Small flames.
3. Lack of primary air — Yellow tipping on flames (sooting will occur).

Figure 27 Typical main burner flame



7c Start-up — if boiler doesn't start . . .

Check for:

1. Loose connections, blown fuse or service switch off?
2. High limit switch set below boiler water temperature?
3. Thermostat set below room temperature?
4. Gas not turned on at meter or boiler?
5. Incoming gas pressure less than 5" w.c. for natural gas?
6. If none of the preceding corrects the problem, refer to **Troubleshooting**, Section **11** of this manual.

NOTICE

If the boiler water temperature is below tankless heater low limit setting, boiler can be started even if thermostat is set above room temperature.

8 Check-out procedure — checklist

- ❑ Boiler and heat distribution units filled with water?
- ❑ Automatic air vent, if used, open one full turn?
- ❑ Air purged from system?
- ❑ Air purged from gas piping? Piping checked for leaks?
- ❑ Correctly sized manifold orifices installed? Refer to page 12 to check size.

⚠ DANGER Correctly sized manifold orifices must be used. Failure to do so will cause severe personal injury, death or substantial property damage.

- ❑ Followed operating instructions on boiler or in manual Section **9** for proper start-up?
- ❑ Proper burner flame observed? Refer to **Check burner flames**, manual Section **7b**.
- ❑ Test limit control — While burners are operating, move indicator on limit control below actual boiler water temperature. Burners should go off while circulator continues to operate. Raise setting on limit control above boiler water temperature and burners should reignite.
- ❑ Test tankless heat low limit control — While burners are operating, move indicator on low limit control above actual boiler water temperature. The 3-way valve should operate to bypass all flow around the boiler. If low limit and valve operate correctly, turn setting on low limit back to normal. The 3-way valve should return to normal position.
- ❑ Test additional field-installed controls — If boiler has a low water cutoff, additional high limit or other controls, test for operation as outlined by manufacturer. Burners should be operating and should go off when controls are tested. When controls are restored, burners should reignite. Test ambient temperature switch by disconnecting one of the wires from the switch. Boiler shut down until wire is replaced.
- ❑ Test ignition system safety device:
  a. Connect manometer to outlet side of gas valve.
  b. Start boiler, allowing for normal start-up cycle to occur and main burners to ignite.
  c. With main burners on, manually shut off gas supply at manual main shutoff gas valve. Burners should go off.
  d. Open manual main shutoff gas valve. Manometer should confirm there is no gas flow.
  e. Pilot will relight, flame sensing element will sense pilot flame and main burners will reignite.
- ❑ Set limit control(s) to system temperature requirements. Adjust balancing valves and controls to provide design temperature to system.
- ❑ For multiple zones, adjust flow so it is about the same in each zone.
- ❑ Verify thermostat heat anticipator (if available) set properly? Refer to **Field wiring**, manual Section **6**, page 29, **Thermostat**.
- ❑ Cycle boiler with thermostat — Raise to highest setting and verify boiler goes through normal start-up cycle. Lower to lowest setting and verify boiler goes off.
- ❑ Measure natural gas input:
  a. Operate boiler 10 minutes.
  b. Turn off other appliances.
  c. At natural gas meter, measure time (in seconds) required to use one cubic foot of gas.
  d. Calculate gas input:

$$\frac{3600 \times 1000}{\text{number of seconds from step c}} = \text{Btuh}$$

  e. Btuh calculated should approximate input rating on boiler rating label.
- ❑ Check manifold gas pressure by connecting manometer to downstream test tapping on main gas valve. Manifold pressure for natural gas should be 3.5" w.c.
- ❑ Observe several operating cycles for proper operation.
- ❑ Set room thermostat to desired room temperature.
- ❑ Fill in Installation and service certificate below?
- ❑ Review all instructions shipped with this boiler with owner or maintenance person. Return instructions to envelope and give to owner or place in pocket inside front panel in boiler.

Installation and service certificate

Boiler model _____ Series _____ CP number _____ Date installed _____

Measured Btuh input _____

- ❑ Installation instructions have been followed.
- ❑ Check out sequence has been performed.
- ❑ Above information is certified to be correct.
- ❑ Information received and left with owner/maintenance person

Installer _____ (company) _____ (address) _____ (phone)

Installer's signature: _____

9a Operation — sequence

1. **Read Operating Instructions** in Section **9c**. This information is also located on a label on the inside of the boiler jacket door panel. Notice that either the room thermostat or the tankless heater low limit control can cause a call for heat.
2. **Raise** room thermostat (or raise setting of tankless heater low limit control) to call for heat.
3. **Circulator energizes.** If limit circuit is closed, the inducer starts. After pressure switch proves proper airflow, control module initiates 10-second prepurge.
4. **Control module sparks** the pilot and opens pilot valve in main gas valve.
   a. If pilot **does not** light within 15 seconds, pilot valve is closed and spark generator is turned off. Control module initiates a 15-second postpurge, then starts a new cycle.
   b. If pilot **does** light and control module senses flame current, spark generator is turned off and main valve opens.
5. **During main burner operation:**
   a. Control module monitors pilot flame current. **If signal is lost,** main valve closes, spark generator activates and sequence returns to step **4**.
   b. **If power is interrupted,** control system **shuts off** pilot and main gas valves and restarts at step **1** when power is restored.
6. In the event the **limit control shuts down the boiler** — The control module closes the pilot and main gas valves, but keeps the inducer operating for 15-second postpurge.
   — The circulator continues to operate.
7. **Lower** room thermostat setting (or lower tankless heater low limit control setting) to stop call for heat. Pilot and main gas valves close — Inducer operates for 15-second postpurge — Circulator shuts off.
8. Boiler is now in the **off cycle.**
9. **Repeat** steps **1** through **6** several times to verify operation.
10. **Return** the thermostat or tankless heater low limit to normal setting.
11. Set thermostat heat anticipator setting as instructed in **Figure 29**, page 35.

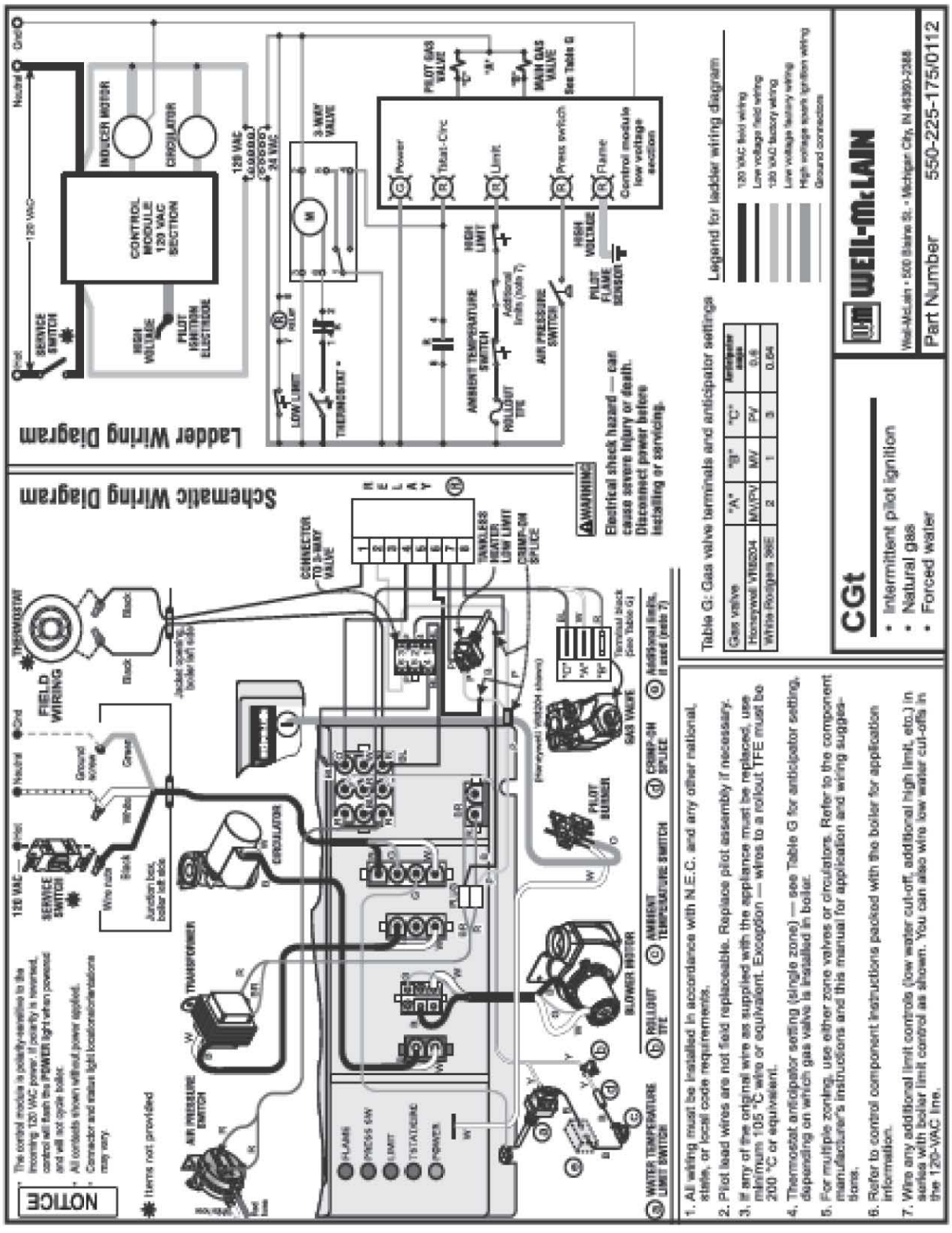
Figure 28 Control module sequence of operation — status light indications

Steps (Following step 8, cycle goes back to step 1.)	Call for heat?	POWER	TSTAT CIRC	LIMIT	PRESS SWITCH	FLAME	Timing
1. Standby · Waiting for call for heat	NO	☀	∩	∩	∩	∩	—
2. Call for heat · Circulator on	YES	☀	☀	∩	∩	∩	—
3. High limit circuit · Limit controls closed · Rollout TPE contacts closed · Ambient temperature switch closed	YES	☀	☀	☀	∩	∩	—
4. Inducer · Inducer turns on	YES	☀	☀	☀	∩	∩	—
5. Pressure circuit · Pressure switch contacts closed · Prepurge for 10 seconds	YES	☀	☀	☀	☀	∩	10 sec
6. Pilot flame proven * · Gas valve open · Pilot remains on · Boiler producing heat	YES	☀	☀	☀	☀	☀	15 sec
7. Limit cycle · Limit circuit open · Gas valve closed	YES	☀	☀	∩	∩	∩	—
8. Flame outage * · Flame out · Boiler recycles	YES	☀	☀	☀	☀	∩	—
9. Thermostat and tankless heater low limit satisfied · Circulator off · Blower postpurge	NO	☀	∩	☀	☀	∩	15 sec
10. Circulator exercise routine · Circulator turns on for 30 seconds if boiler not operated for 30 days	NO	☀	∩	∩	∩	∩	30 sec
		☀ or ☀ = "ON"		∩ = "OFF"			

* If pilot flame is not proven in 15 seconds, control module will flash the FLAME light, but will continue indefinitely with attempts to light the pilot burner. The control module will not lockout on a failure to establish flame. It will lockout if line voltage polarity is reversed, stray voltage is sensed on thermostat line, pressure switch sticks closed or fails to make within 5 minutes or if flame is sensed when it shouldn't be there. The boiler will reset after these lockouts if any of the following occurs:
· 1 hour waiting period · Opening and closing of thermostat circuit · Removal of 120 VAC power for at least 45 seconds. 025907

9b Operation — wiring diagram

Figure 29 Schematic and ladder wiring diagram


Ladder Wiring Diagram
Schematic Wiring Diagram
CGt
• Intermittent pilot ignition
• Natural gas
• Forced water
WEIL-McLAIN
Part Number 550-225-175/0112
Table G: Gas valve terminals and anticipator settings
Legend for ladder wiring diagram
NOTICE
1. All wiring must be installed in accordance with N.E.C. and any other national, state, or local code requirements.
2. Pilot lead wires are not field replaceable. Replace pilot assembly if necessary.
3. If any of the original wire as supplied with the appliance must be replaced, use minimum 105 °C wire or equivalent. Exception — wires to a rollout TFE must be 200 °C or equivalent.
4. Thermostat anticipator setting (single zone) — see Table G for anticipator setting, depending on which gas valve is installed in boiler.
5. For multiple zoning, use either zone valves or circulators. Refer to the component manufacturer's instructions and this manual for application and wiring suggestions.
6. Refer to control component instructions packed with the boiler for application information.
7. Wire any additional limit controls (low water cut-off, additional high limit, etc.) in series with boiler limit control as shown. You can also wire low water cut-offs in the 120-VAC line.

9c Operating instructions

- Spark pilot • Natural or propane gas
- Gas valve: Honeywell VR8204/VR8304

FOR YOUR SAFETY READ BEFORE OPERATING

⚠WARNING If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

A. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.

B. BEFORE OPERATING, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor. See below.

C. Use only your hand to turn the gas control knob. Never use tools. If the knob will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

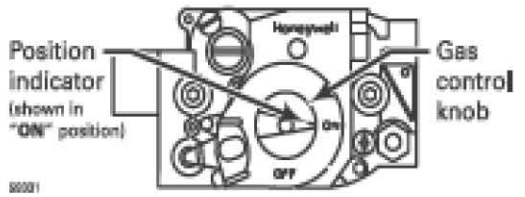
D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control, which has been under water.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. Set the thermostat to lowest setting.
3. Turn off all electrical power to the appliance.
4. Remove front panel.
5. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
6. Turn gas control knob clockwise ↷ to "OFF."



7. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the safety information above. If you don't smell gas, go to the next step.
8. Turn gas control knob counterclockwise ↶ to "ON."
9. Turn on all electric power to the appliance.
10. Set thermostat to desired setting.
11. If the appliance will not operate, follow the instructions "To Turn Off Gas To The Appliance" and call your service technician or gas supplier.
12. Replace front panel.

TO TURN OFF GAS TO THE APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove front panel.
4. Turn gas control knob clockwise ↷ to "OFF." Do not force.
5. Replace front panel.

550-223-041(0906)

9c Operating instructions

- Spark pilot • Natural or propane gas
- Gas valve: White-Rodgers 36E

FOR YOUR SAFETY READ BEFORE OPERATING

⚠WARNING If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

A. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.

B. BEFORE OPERATING, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor. See below.

C. Use only your hand to turn the gas control knob. Never use tools. If the knob will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

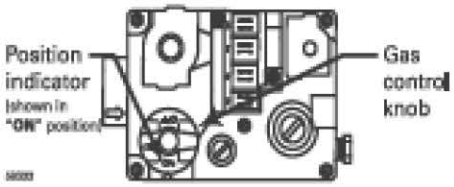
D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control, which has been under water.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. Set the thermostat to lowest setting.
3. Turn off all electrical power to the appliance.
4. Remove front panel.
5. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
6. Turn gas control knob clockwise ↷ to "OFF."



7. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the safety information above. If you don't smell gas, go to the next step.
8. Turn gas control knob counterclockwise ↶ to "ON."
9. Turn on all electric power to the appliance.
10. Set thermostat to desired setting.
11. If the appliance will not operate, follow the instructions "To Turn Off Gas To The Appliance" and call your service technician or gas supplier.
12. Replace front panel.

TO TURN OFF GAS TO THE APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove front panel.
4. Turn gas control knob clockwise ↷ to "OFF." Do not force.
5. Replace front panel.

550-223-042(0906)

9c Operating instructions

- Spark pilot • Natural or propane gas
- Gas valve: White-Rodgers 36C

FOR YOUR SAFETY READ BEFORE OPERATING

⚠WARNING If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

A. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.

B. BEFORE OPERATING, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor. See below.

C. Use only your hand to depress or turn the gas control knob. Never use tools. If the knob will not depress or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

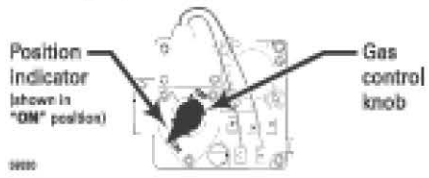
D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control, which has been under water.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. Set the thermostat to lowest setting.
3. Turn off all electrical power to the appliance.
4. Remove front panel.
5. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
6. Depress gas control knob slightly and turn clockwise ↷ to "OFF." Note: Knob cannot be turned to "OFF" unless knob is depressed slightly. Do not force.



7. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the safety information above. If you don't smell gas, go to the next step.
8. Turn gas control knob counterclockwise ↶ to "ON."
9. Turn on all electric power to the appliance.
10. Set thermostat to desired setting.
11. If the appliance will not operate, follow the instructions "To Turn Off Gas To The Appliance" and call your service technician or gas supplier.
12. Replace front panel.

TO TURN OFF GAS TO THE APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove front panel.
4. Depress gas control knob slightly and turn clockwise ↷ to "OFF." Do not force.
5. Replace front panel.

550-223-043(0906)

10a Service and maintenance — schedule

VERIFY PROPER OPERATION AFTER SERVICING

Table 8 Service and maintenance schedules

Service technician (see following pages for instructions)		Owner maintenance (see CGt User's Information Manual for instructions)	
ANNUAL START-UP	**Inspect:** • Reported problems • Boiler area • Air openings • Flue gas vent system • Pilot and main burner flames • Water piping • Boiler heating surfaces • Burners and burner shield • Condensate drain system **Service:** • Inducer motor • Oiled-bearing circulators **Start-up:** • Perform start-up per manual **Check/test:** • Gas piping • Cold fill and operating pressures • Air vents and air elimination • Limit controls and cutoffs • Expansion tank • Boiler relief valve **Review:** • Review with owner	Daily	• Check boiler area • Check air openings • Check boiler pressure/ temperature gauge
		Monthly	• Check boiler interior piping • Check venting system • Check air vents • Check boiler relief valve • Check condensate drain system • Check automatic air vents (if used)
		Periodically	• Test low water cutoff (if used)
		Every 6 months	• Operate relief valve
		End of season	• Shut down procedure

⚠WARNING Follow the **Service and maintenance** procedures given throughout this manual and in component literature shipped with the boiler. Failure to perform the service and maintenance could result in damage to the boiler or system. Failure to follow the directions in this manual and component literature could result in severe personal injury, death or substantial property damage.

10b Service and maintenance — annual start-up

⚠WARNING The boiler should be **inspected and started annually**, at the beginning of the heating season, **only by a qualified service technician.** In addition, the maintenance and care of the boiler designated in **Table 8**, page 39, and explained on the following pages must be performed to assure maximum boiler efficiency and reliability. Failure to service and maintain the boiler and system could result in equipment failure.

⚠WARNING **Eliminate all system or boiler leaks.** Continual fresh makeup water will reduce boiler life. Minerals can build up in sections, reducing heat transfer, overheating cast iron, and causing section failure. Leaking water may also cause severe property damage.

⚠DANGER Do not use **petroleum-based cleaning or sealing compounds** in boiler system. Severe damage to boiler will occur, resulting in substantial property damage.

⚠WARNING Electrical shock hazard — **Turn off power to the boiler before any service operation** on the boiler except as noted otherwise in this instruction manual. Failure to turn off electrical power could result in electrical shock, causing severe personal injury or death.

❑ Inspect . . .

Reported problems

Inspect any problems reported by owner and correct before proceeding.

Boiler area

1. Verify that boiler area is free of any **combustible materials**, gasoline and other flammable vapors and liquids.
2. Verify that boiler area (and air intake) is free of any of the **contaminants** listed in **Table 1** on page 9 of this manual. If any of these are present in the boiler intake air vicinity, they must be removed. If they cannot be removed, isolate the boiler and provide outside combustion air. See national, provincial or local codes for further information.

Air openings

1. Verify that combustion and ventilation air openings to the boiler room and/or building are open and **unobstructed.**
2. Verify that boiler vent discharge is **clean and free of obstructions.**

Flue gas vent system

1. **Visually inspect entire flue gas venting system** for blockage, deterioration or leakage. Repair any joints that show signs of leakage in accordance with vent manufacturer's instructions.

⚠WARNING **Failure to inspect** for the above conditions and have them repaired can result in severe personal injury or death.

Pilot and main burner flames

1. Visually inspect pilot burner and main burner flames as directed under **Start-up**, Section **7b** of this manual.

Water piping

1. Check the boiler interior piping and all system piping for signs of leaks.
2. Repair any leaks before proceeding.

Boiler heating surfaces

1. Disconnect the vent pipe at the boiler inducer outlet connection after turning off power to the boiler.
2. Use a bright light to inspect the flue pipe interior and inducer interior.
3. Inspect the boiler vent outlet area and heating surfaces by looking through the opening.
4. If the vent pipe or inducer interior show evidence of soot, follow **Cleaning boiler heating surfaces** in this manual section to remove the flue collector and clean the boiler if necessary after close inspection of boiler heating surfaces. If there is evidence of rusty scale deposits, check the water piping and control system to make sure the boiler return water temperature is properly maintained (per this manual).
5. Reconnect vent to inducer outlet and replace all boiler components before returning to service.
6. Check inside and around boiler for evidence of any leaks from the boiler. If found, locate source of leaks and repair.

10b Service and maintenance – annual start-up (cont.)

❑ Inspect . . .

Burners and base

⚠WARNING The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on **page 68** of this manual. Failure to comply could result in severe personal injury.

⚠WARNING If insulation is damaged or displaced, do not operate the boiler. Replace or reposition insulation as necessary. Failure to replace damaged insulation can result in a fire hazard, causing severe personal injury, death or substantial property damage.

1. After turning off power to the boiler, remove the base burner shield (**Figure 37**, item **4**, page 60).
2. Inspect burners and all other components in the boiler base.
3. If burners must be cleaned see **Burner cleaning instructions** below.
4. Inspect the slotted jacket cooling openings in the bottom left and right of the base pan (**Figure 37**, item **7**, page 60).
5. Inspect the base insulation. Pay attention to the **WARNING** on page 68 regarding working with insulation materials. Verify that the insulation is intact and secure against all four sides of the base.

Burner cleaning instructions

⚠WARNING Airborne materials, such as fiberglass and dust, are present during construction and remodeling. These materials can be drawn in with the combustion air and obstruct burner ports, resulting in carbon monoxide production, a fire hazard, or building freeze damage. Read and follow the **WARNING** on page 9. Failure to inspect and clear gas burner ports could result in severe personal injury, death or substantial property damage.

1. Remove burner shield and the base pan air baffle. Next remove the pilot bracket assembly. Then remove the four screws securing the burner tray to the manifold and slide the burner tray out under the manifold.
2. Inspect each burner to insure that every port is completely open.
3. If any port is not completely clear, run a vacuum at the burner inlet while cleaning the burner ports with a wire brush. The vacuum will help to draw any airborne material out of the burner.
4. Reinstall components, starting with the burner tray, then the pilot bracket assembly, burner baffle, and air inlet top and front panels.
5. Follow the start-up procedure in the boiler manual.

Condensate drain system

1. Inspect condensate drain fittings and tubing. Verify that condensate can flow freely to drain.

❑ Service . . .

Inducer motor

1. With boiler power **off**, place a few drops of S.A.E. 20 motor oil in each of the two oil cups.

⚠WARNING Use only **S.A.E. 20 motor oil** to lubricate the inducer motor. Do not use universal household oils. Motor could be damaged, resulting in possible severe property damage.

Oiled-bearing circulators

1. The circulator shipped with the CGi boiler is water-lubricated. No oiling is required.
2. Check other circulators in the system. Oil any circulators requiring oil, following circulator manufacturer's instructions. Over-oiling will damage the circulator.

❑ Start-up . . .

1. Perform all start-up procedures in Section **7** of this manual.
2. Verify **cold fill pressure** is correct and that fill system is working properly.
3. Verify **antifreeze level** (if used) is at the right concentration and that inhibitor level is correct.
4. **Check gas piping** per manual Sections **5**, and **7a**, verifying no indications of leakage and all piping and connections are in good condition.
5. Read the **Operating Instructions** (Section **9c** of this manual or on boiler label) applying to the boiler.
6. Start the boiler following the appropriate **Operating Instructions** (Section **9c** of this manual or on boiler label).

10b Service and maintenance – annual start-up (cont.)

❑ Check/test . . .

Gas piping

1. Sniff near floor and around boiler area for any indication of a **gas leak.**
2. **Test gas piping using bubble test,** per Section **5** of this manual, if there is any indication of a leak.

Cold fill and operating pressures

1. While the system is cold, note the **pressure reading** on the boiler pressure/temperature gauge. Verify that cold fill pressure is correct.
2. **Watch the pressure** as the boiler and system heat up to ensure pressure rise is normal. Too high a rise would indicate a waterlogged or undersized expansion tank.

Air vents and air elimination

1. Inspect automatic air vents (if used). Also inspect air separators to ensure they are operational.
2. The cap must be unscrewed one turn to allow air to escape.
3. See **Figure 31.** If the air vent is leaking, remove cap **A** and briefly push valve **B** and then release to clean the valve seat.
4. Replace cap **A** by twisting all the way onto valve **B** and then unscrewing one turn.

Figure 31 Automatic air vent, typical

Limit controls and cutoffs

1. Inspect and test the boiler limit control. Verify operation by turning control set point below boiler temperature. Boiler should cycle off. Return dial to original setting.
2. Inspect and test additional limit controls or low water cutoffs installed on system.

Expansion tank

1. Expansion tanks provide space for water to move in an out as the heating system water expands due to temperature increase or contracts as the water cools. Only diaphragm-type or bladder-type tanks should be used with CGt boilers. See Section **4** of this manual for suggested best location of expansion tanks and air eliminators.
2. **Diaphragm- or bladder-type expansion tanks** These tanks are welded gas tight with a rubber membrane to separate the tank pressurizing air and the water. May be located at any point in the system, but most often found near the boiler.
   - Systems with this type of expansion tank require at least one **automatic air vent,** preferably located on top of an air eliminator, as shown in examples in manual Section **4.**
3. If relief valve has tended to weep frequently, the expansion tank may be damaged or undersized.
   - First, check tank size to be sure it is large enough for the system.
   - If size is too small, add additional tank(s) as necessary to provide sufficient expansion.
   - If tank size is large enough, remove tank from system and check charge pressure (usually 12 psig for residential applications).
   - If tank won't hold pressure, membrane has been damaged. Replace tank.

Boiler relief valve

1. Inspect the relief valve and lift the lever to verify flow as in the following warnings, excerpted from a relief valve manufacturer's warning label. Before operating any relief valve, ensure that it is piped with its discharge in a safe area to avoid severe scald potential. Read manual Section **4** before proceeding further.
2. After following the above warning directions, if the relief valve weeps or will not seat properly, replace the relief valve. Ensure that the reason for relief valve weeping is the valve and not over-pressurization of the system due to expansion tank waterlogging or undersizing.

10b Service and maintenance – annual start-up (cont.)

⚠WARNING

Safety relief valves should be **reinspected AT LEAST ONCE EVERY THREE YEARS**, by a licensed plumbing contractor or authorized inspection agency, to ensure that the product has not been affected by corrosive water conditions and to ensure that the valve and discharge line have not been altered or tampered with illegally. Certain naturally occurring conditions may corrode the valve or its components over time, rendering the valve inoperative. Such conditions are not detectable unless the valve and its components are physically removed and inspected. This inspection must only be conducted by a plumbing contractor or authorized inspection agency — not by the owner. Failure to reinspect the boiler relief valve as directed could result in unsafe pressure buildup, which can result in severe personal injury, death or substantial property damage.

Figure 32 — Relief valve, typical

⚠WARNING

Following installation, the **valve lever must be operated AT LEAST ONCE A YEAR** to ensure that waterways are clear. Certain naturally occurring mineral deposits may adhere to the valve, rendering it inoperative. When manually operating the lever, water will discharge and precautions must be taken to avoid contact with hot water and to avoid water damage. Before operating lever, check to see that a discharge line is connected to this valve directing the flow of hot water from the valve to a proper place of disposal otherwise severe personal injury may result. **If no water flows, valve is inoperative.** Shut down boiler until a new relief valve has been installed.

❑ Review with owner

1. Review the **User's Information Manual** with the owner.
2. Emphasize the need to perform the maintenance schedule specified in the **User's Information Manual** (and in this manual as well).
3. Remind the owner of the need to call in a licensed contractor should the boiler or system exhibit any unusual behavior.
4. Remind the owner to follow the proper shutdown procedure and to schedule an annual start-up at the beginning of the next heating season.

❑ Cleaning boiler heating surfaces

⚠WARNING

The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on **page 68** of this manual. Failure to comply could result in severe personal injury.

1. Shut down boiler:
   - Follow **"To Turn Off Gas to Appliance"** instructions on boiler and **Operating instructions**.
   - Do not drain boiler unless it will be exposed to freezing temperatures. If using antifreeze in system, do not drain.
2. Follow shutdown procedure.
3. Remove venting system connection to boiler.
4. Remove top jacket panel. Turn back insulation.
5. Remove collector box/transition assembly. Clean sealant from assembly and sections.
6. Remove radiation plates hanging between sections.
7. Remove burners from base. Brush and vacuum burners to remove all dust and lint. Verify that all burner ports are free of debris.
8. Place newspapers in base of boiler to collect soot.
9. Clean between sections with wire flue brush.
10. Remove newspaper and soot. Vacuum or brush base and surrounding area.
11. Reinstall radiation plates.
12. Replace collector box/transition assembly. Seal with sealant. Obtain gas-tight seal to prevent flue gas spillage and carbon monoxide emissions, resulting in severe personal injury or death.
13. Replace insulation and jacket top panel.
14. Start up boiler following Section **7** of this manual and the boiler **Operating instructions**, Section **9c**. Excessive sooting indicates improper gas combustion. If found check for proper combustion and make any necessary adjustments.

Instruction for the Commonwealth of Massachusetts

(a) For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1. **INSTALLATION OF CARBON MONOXIDE DETECTORS.** At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gas fitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gas fitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors
   a. In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.
   b. In the event that the requirements of this subdivision can not be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.
2. **APPROVED CARBON MONOXIDE DETECTORS.** Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.
3. **SIGNAGE.** A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, "GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS."
4. **INSPECTION.** The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08(2)(a) 1 through 4.

(b) **EXEMPTIONS:** The following equipment is exempt from 248 CMR 5.08(2)(a)1 through 4:

1. The equipment listed in Chapter 10 entitled "Equipment Not Required To Be Vented" in the most current edition of NFPA 54 as adopted by the Board; and
2. Product Approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

(c) **MANUFACTURER REQUIREMENTS — GAS EQUIPMENT VENTING SYSTEM PROVIDED.** When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:

1. Detailed instructions for the installation of the venting system design or the venting system components; and
2. A complete parts list for the venting system design or venting system.

(d) **MANUFACTURER REQUIREMENTS — GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED.** When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the flue gases, but identifies "special venting systems", the following requirements shall be satisfied by the manufacturer:

1. The referenced "special venting system" instructions shall be included with the appliance or equipment installation instructions; and
2. The "special venting systems" shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.

(e) A copy of all installation instructions for all Product Approved side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

11a Troubleshooting — procedure

⚠WARNING Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

⚠WARNING Never jumper (bypass) rollout thermal fuse element or any other device except for momentary testing as outlined in **Troubleshooting Charts**. Severe personal injury, death or substantial property damage can result.

Before troubleshooting:

1. Have the following items:
   a. Voltmeter that can check 120 VAC and 24 VAC.
   b. Microammeter with a minimum scale range of 0-25.
   c. Continuity checker.
   d. U-tube manometer.
2. Check for 120 VAC (minimum 102 VAC to maximum 132 VAC) to boiler.
3. Make sure thermostat is calling for heat and contacts (including appropriate zone controls) are closed. Check for 24 VAC between thermostat wire nuts and ground.

Check the following:

1. Wire connectors to control module are securely plugged in at module and originating control.
2. Air pressure switch hoses are properly and securely plugged in and are not damaged.
3. Gas pressures:
   a. With boiler off — 13" w.c. maximum natural or propane gas pressure upstream of gas valve.
   b. With boiler on:
      - 5" w.c. minimum natural gas pressure or 11" w.c. propane gas pressure upstream of gas valve.
      - 3 ½" w.c. minimum natural gas pressure or 10" w.c. propane gas pressure downstream of gas valve — Can be adjusted by regulator on gas valve.

11b Troubleshooting — components

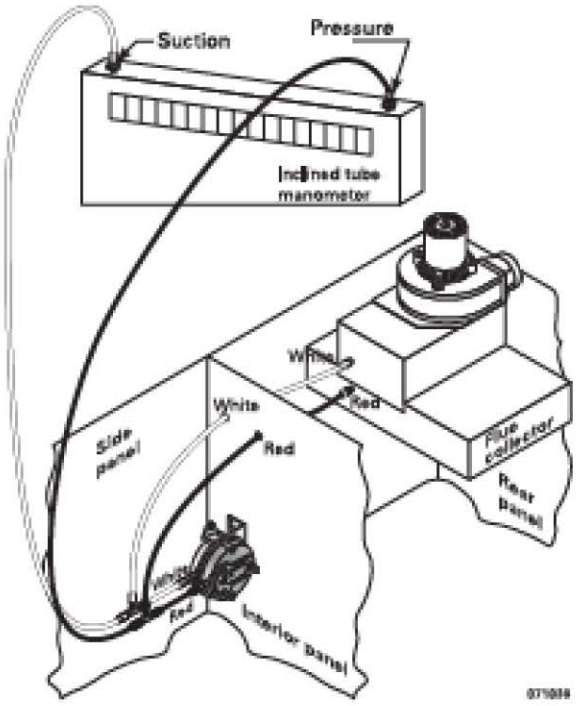
Check pressure switch setting

1. See Figure 33.
2. Remove both air pressure switch hoses from air pressure switch.
3. Install tees and tubing as shown in Figure 33 to inclined manometer.
4. Turn off gas valve and set thermostat to call for heat. Inducer will run but burners will not ignite.
5. Check for 24 VAC between both air pressure switch terminals.
6. If manometer reading is above the setpoint of the switch, but there is not 24 VAC between both air pressure switch terminals — replace air pressure switch.

Pressure switch setpoint

1. The air pressure switch should drop out when the pressure across switch is less than 1.53 inches w.c.

Figure 33 Manometer connections



Troubleshooting air pressure reading

1. If manometer reading is lower than the setpoint of the switch — check for possible causes:
   - blockage in hoses
   - obstruction in inducer housing outlet
   - loose inducer wheel on motor shaft
   - inducer motor not in proper rpm
   - inducer back plate not sealed properly
   - blockage in block assembly
   - blockage in flue pipe or termination
   - incorrect pressure switch

Return to normal operation

When pressure reading is correct and air pressure switch is operating properly — remove tees and reinstall hoses to air pressure switch.

NOTICE

The boiler will not operate correctly unless pressure switch hoses are correctly located. The red hose connects from the right side (negative) hose barb to the flue collector. The white hose connects from the left side (positive) hose barb of the switch to the connector box (between flue collector and inducer) as shown in **Figure 33**.

Ambient temperature switch

The ambient temperature switch wires into the boiler limit circuit. If the temperature in the vicinity of the switch exceeds 135°F, the switch will shut down the boiler.

If the switch shuts down the boiler, check the reason for the high temperature in the space. Increase the size of the ventilation air openings if necessary.

11b Troubleshooting — components (continued)

Control module

⚠WARNING **Solder or water** splatter between plugs and circuit board can cause improper operation of control module. Place a shield over the boiler internal controls and components during installation. Failure to comply could result in severe personal injury, death or substantial property damage.

NOTICE Make sure **ground wiring** is installed per wiring diagram. Good grounding is extremely important for proper operation.

Control indicator lights — LOCKOUT modes

See **Charts 1** through **7** in this section for detailed troubleshooting procedures.

To reset control after a lockout, turn off power at the 120 VAC service switch or turn down all thermostats. Wait 45 seconds. Then restore power or call for heat.

POWER light flashing alone

Usually indicates reversed polarity of 120 VAC power wires.

POWER and TSTAT CIRC lights flashing

Usually indicates stray voltage on external thermostat circuit wires (usually due to miswired 3-wire zone valve).

POWER and PRESS SWITCH lights flashing

Usually indicates pressure switch is closed when it should not be, or pressure switch failed to close within 5 minutes of inducer starting.

POWER and FLAME lights flashing

Usually indicates false flame sense or flame sensed when it shouldn't be there.

Control indicator lights — NONLOCKOUT modes

POWER light on and FLAME light flashing

Usually indicates pilot flame was not established within 15 seconds from application of spark. Control will flash light, but will continue to cycle indefinitely until flame is established or problem is corrected.

POWER light on and PRESS SWITCH light flashing

Usually indicates pressure switch opened during the run cycle.

Troubleshooting the control module

See **Figure 35**, page 48, for location of harness plug receptacles and plugs on the control module.

Figure 34 Control module

3-Way valve

The 3-way valve redirects water flow in the circuit. Normally the valve allows water to flow through the bypass to maintain the heat in the boiler for the tankless heater. The 3-way valve lever is up in the normal position. When the heating thermostat calls for heat, the 3-way valve actuator lever drops which allows water to flow to the space heating system. Check for proper 3-way valve operation as follows:

Tankless operating limit calls for heat, boiler turns on when temperature drops approximately 10 degrees below tankless limit setting (differential). Boiler shuts off when temperature reaches tankless limit setting. The 3-way valve lever stays up all during domestic heating cycle.

Space heating thermostat calls for heat. 3-way valve lever drops and boiler fires providing space heat.
NOTE : If the boiler temperature drops below tankless limit setting minus 10 degree differential, the 3-way valve lever will raise to reheat boiler to tankless limit setting. Then the 3-way valve lever will drop and boiler will resume providing space heating until thermostat is satisfied, boiler limit setting is reached, or temperature in boiler drops below tankless limit setting minus 10 degree differential. Verify valve is installed and wired correctly.

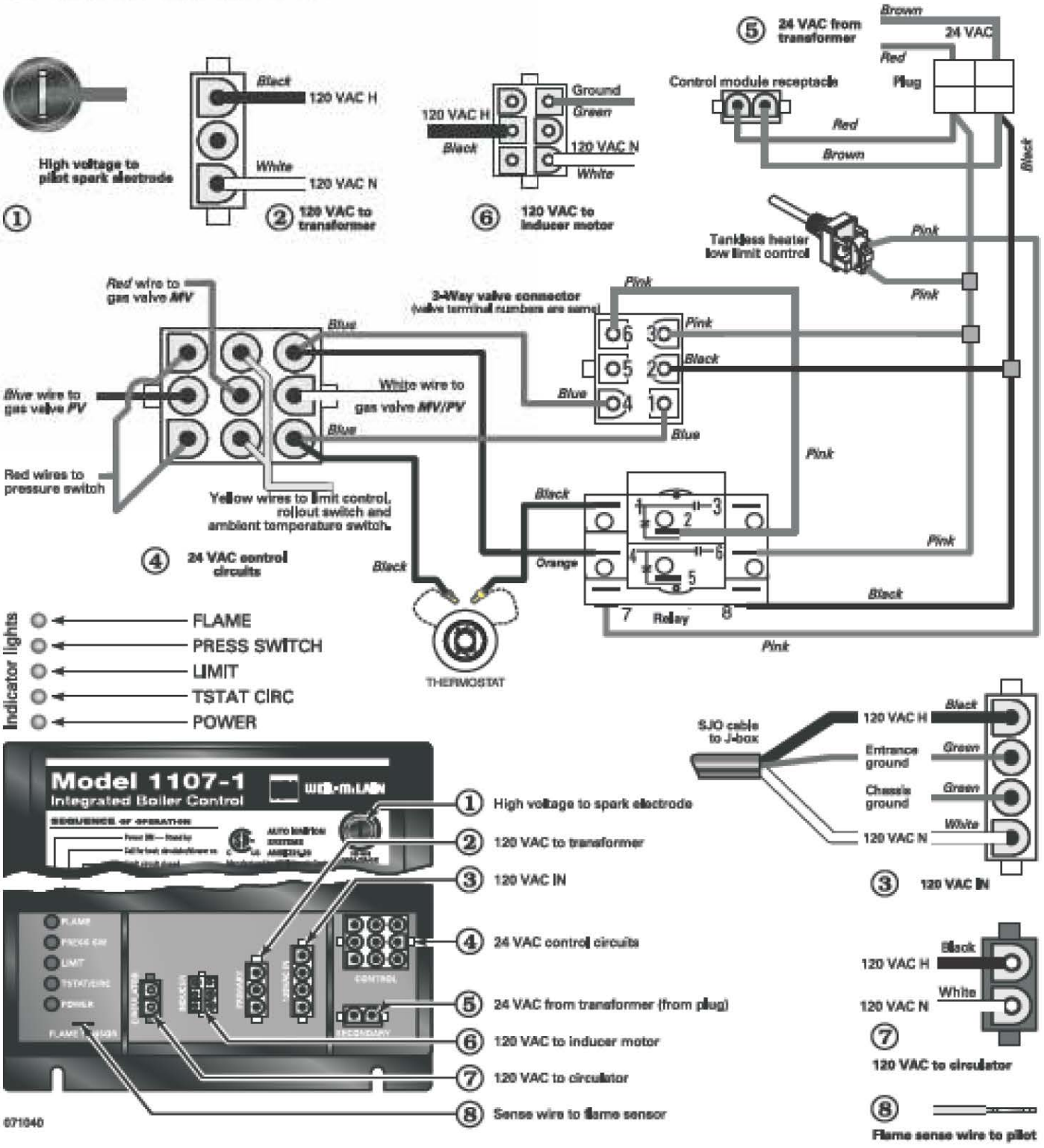
Tankless low limit calls for heat, but boiler does not turn on — Check power to 3-way valve and valve end switch.

Tankless low limit calls for heat, boiler turns on, but there is not enough domestic water supply — Check 3-way valve. It may be stuck in the space heating position.

Thermostat calls for heat, boiler turns on, but there is no flow of hot water to the space heating system — Check whether 3-way valve is stuck in domestic water heating position. Verify valve is installed and wired correctly.

11b Troubleshooting — components (continued)

Figure 35 Control module connections



11c Troubleshooting — control module lights

CHART 1— Troubleshooting POWER light status

— Usually indicates reversed 120 VAC polarity if POWER light flashes by itself —

⚠WARNING Electrical shock hazard — Wherever you see ▲TURN OFF POWER▲, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.

Is POWER light off?

No | Yes

- Make sure service switch or circuit breaker is on or fuses are good.
- Remove **120 VAC IN** plug (**Figure 35, Item 3**, page 48) on control module.
- Using voltmeter, check across top and bottom pins of **120 VAC IN** plug.

*Does voltmeter indicate **120 VAC**?*

No | Yes

Problem is with incoming electricity. Have licensed electrician repair circuit.

- Reconnect **120 VAC IN** plug.
- Remove **120 VAC IN** transformer **PRIMARY** plug (**Figure 35, Item 2**, page 48) on control module.
- Using voltmeter, check across top and bottom pins of **PRIMARY** receptacle.

*Does voltmeter indicate **120 VAC**?*

No | Yes

Replace control module. Retest.

- Reinstall **120 VAC** transformer **PRIMARY** plug.
- Remove **24 VAC** transformer plug (**Figure 35, Item 5**, page 48) on control module.
- Using voltmeter, check pins of plug.

*Does voltmeter indicate **24 VAC**?*

No | Yes

Replace transformer. Retest and check for back feed of voltage from system wiring.

Replace control module. Retest.

Is POWER light ...

Flashing alone | Flashing with another light | On steady (not flashing)

TSTAT CIRC light flashing	Chart 2	
PRESS SWITCH light flashing	Chart 3	Chart 5
FLAME light flashing	Chart 4	Chart 6

For insufficient heat or no heat problem, go to Chart 7, page 55, if **POWER** light is on steady, with no other light flashing.

- Usually indicates polarity on incoming **120 VAC** power line is wrong.
- ▲**TURN OFF POWER**▲ at service switch or breaker, then reverse the HOT and NEUTRAL wires entering the boiler in the J-box.
- Restore **POWER** at service switch or breaker.

Is POWER light flashing now?

No | Yes

Boiler should now operate normally.

Have system checked by a licensed electrician. If problem persists, call your local Weil-McLain sales representative.

11c Troubleshooting — control module lights (cont.)

CHART 2 — TSTAT CIRC & POWER lights flashing

— Usually indicates 48 VAC on thermostat circuit (stray voltage) —

⚠WARNING Electrical shock hazard — Wherever you see sTURN OFF POWERs, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.

- Disconnect the two external wires connected to the boiler thermostat leads (two black low voltage leads in J-box).
- Connect a voltmeter across these two incoming wires. Close each thermostat, zone valve and relay in the external circuit one at a time and check the voltmeter reading across the wires.
- There should NEVER be a voltage reading.
- If a voltage does occur under any condition, check and correct the external wiring.
- Once the external thermostat circuit wiring is checked and corrected if necessary, reconnect the external thermostat circuit wires to the boiler thermostat wires and allow the boiler to cycle.

Did you find a voltage across the two external thermostat circuit wires?

Yes

- Leave external boiler thermostat connection wires disconnected from boiler.
- Troubleshoot the external thermostat circuit until you find the source of the stray voltage. (Pay close attention to the wiring connections to 3-wire zone valves.)
- Correct the problem and repeat the voltmeter test above, verifying there is no longer a voltage reading under any condition in the external thermostat circuit.
- An isolating relay may be required.

- Boiler should now operate per the normal sequence of operation shown in **Figure 28**, page 34.

No

- If no voltage is found under any condition of the external thermostat circuit, connect the two boiler thermostat connection leads together (or jumper the boiler aquastat T-T terminals).
- Turn off power to the boiler for 1 minute.
- Turn on power and allow boiler to cycle.

Do the **TSTAT** *and* **POWER** *lights still flash?*

No

Yes

- Replace control module.
- Retest.

11c Troubleshooting — control module lights (cont.)

CHART 3 — PRESS SWITCH & POWER lights flashing

— Usually indicates pressure switch stuck closed or failed to make within 5 minutes —

⚠WARNING Electrical shock hazard — Wherever you see ▲TURN OFF POWER▲, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.

- Reset boiler control by turning off power at service switch or turning down thermostat for at least 45 seconds.
- Thermostat should call for heat and appropriate zone valves open.

Does inducer motor operate?

No

- Wait 45 seconds.

Does inducer motor operate?

No

- Remove **INDUCER** plug (*Figure 35, Item 6, page 48*) from plug receptacle of control module.
- Place voltmeter leads across the **120 VAC N** and **120 VAC H** pins of the **INDUCER** receptacle (left column center and right column bottom pins).

Does the voltmeter indicate 120 VAC?

No

- Remove one of the wires connected to the pressure switch.
- Check continuity across the switch terminals.

Does the ohmmeter indicate the switch is closed?

No

- Replace control module.
- Retest.

Yes

- Check air pressure switch per manual Section 11, page 46.
- Replace if necessary.
- Retest.

Yes

- Try reseating plug in module receptacle and restart.
- If inducer still does not work, replace inducer assembly.
- Retest.

Yes

- Wait 5 minutes.

Is **PRESS SWITCH** *light flashing?*

No

- Boiler should be in normal operating sequence.
- Observe operation until thermostat is satisfied and inducer has completed its post-purge cycle.

Yes

Are vent or combustion air passages blocked?

No

- Clear passages and recycle boiler.
- Recheck boiler operation.

Yes

11c Troubleshooting — control module lights (cont.)

CHART 4 — FLAME & POWER lights flashing

— Usually indicates flame sensed when it shouldn't be there —

⚠WARNING Electrical shock hazard — Wherever you see ▲TURN OFF POWER▲, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.

Are manual main shutoff valve and gas valve open?

No

- Leave main manual gas valve closed.
- Turn off power to boiler at service switch or breaker.
- Wait at least 45 seconds.
- Turn on power to boiler.
- Restart boiler, following **Operating instructions** in this manual (Section 9c).

Do **FLAME** *and* **POWER** *lights still flash?*

No

- ▲TURN OFF POWER▲ to boiler at service switch or breaker.
- Open main manual gas valve.
- Turn on power to boiler at service switch or breaker.
- Restart boiler per lighting instructions.
- Perform start-up procedures in boiler manual to verify proper operation.

Yes

- Replace control module.
- Retest.

Yes

- Turn off power to the boiler at service switch or breaker.
- Wait at least 45 seconds.
- Turn on power to boiler.
- Restart boiler, following **Operating instructions** in this manual (Section 9c).
- Look through the pilot inspection port to see if the pilot is burning during the prepurge period (first 10 seconds of operation).

Is pilot burning during prepurge period?

No

- Allow boiler to continue cycling.

Are FLAME & POWER lights flashing?

No

- Boiler may now be operating normally.
- Perform start-up procedures in boiler manual to verify proper operation.

Yes

- Replace control module.
- Retest.

Yes

- Replace gas valve.
- Retest boiler.

Are FLAME and POWER lights flashing?

No

- Boiler should now operate normally.
- Original flashing FLAME light caused by gas valve not operating properly.
- See normal sequence of operation, **Figure 28**, page 34.

Yes

- Replace control module.
- Retest.

11c Troubleshooting — control module lights (cont.)

CHART 5 — PRESS SWITCH light flashing and POWER light on steady

— Usually indicates pressure switch opened during run cycle —
— May also be caused by wind gusts in excess of 40 mph for non-direct vent sidewall-vented boilers —

⚠WARNING Electrical shock hazard — Wherever you see ▲TURN OFF POWER▲, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.

- Reset boiler control by turning off power at service switch or turning down thermostat for at least 45 seconds.
- Thermostat should call for heat and appropriate zone valves open.

Does blower motor operate?

No

- Remove **INDUCER** plug (*Figure 35, Item 6, page 48*) from plug receptacle of control module.
- Place voltmeter leads across the **120 VAC N** and **120 VAC H** pins of the **INDUCER** receptacle (left column center and right column bottom pins).

*Does the voltmeter indicate **120 VAC**?*

No

- Remove one of the wires connected to the pressure switch.
- Check continuity across the switch terminals.

Does the ohmmeter indicate the switch is closed?

No

- Inspect and check wire harness from control module to pressure switch.
- Reseat connector in control module receptacle.
- If harness is intact and properly seated, but problem persists, replace control module.
- Retest.

Yes

- Replace inducer assembly.
- Retest.

Yes

- Wait 5 minutes.

*Is **PRESS SWITCH** light flashing?*

No

- Boiler should be in normal operating sequence.
- Observe operation until thermostat is satisfied and inducer has completed its post-purge cycle.

Yes

Is vent blocked?

No

- Check air pressure switch per manual Section 11b, page 46.
- Replace if necessary. Retest.

Yes

- Clear vent and recycle boiler.
- Recheck boiler operation.

11c Troubleshooting — control module lights (cont.)

CHART 6 — FLAME light flashing and POWER light on steady

ALSO — Troubleshooting failure to establish main flame

⚠WARNING Electrical shock hazard — Wherever you see ▲TURN OFF POWER▲, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.

- Are main manual shutoff valve and boiler gas valve open?

No → ▲TURN OFF POWER▲ to boiler at service switch or breaker.
- Open main manual shutoff valve and boiler gas valve (per **Operating Instructions** in this manual). Wait at least 45 seconds.
- Turn on power at service switch or breaker. Allow boiler to cycle.

Does **FLAME** *light flash now?*

No → Boiler should be in normal operating sequence.
- Observe operation until thermostat is satisfied and blower has completed its post-purge cycle.

Yes → Verify inlet gas pressure at gas valve:

Natural gas — 5.0" w.c. min/14.0" w.c. max

Is gas present at gas valve inlet and within above range?

No → Contact gas supplier to correct pressure or gas supply.

Yes → ▲TURN OFF POWER▲ to boiler at service switch or breaker.
- Remove burner shield (see *Figure 37, item 4, page 60*, for location).
- Verify pilot gas line is not kinked, obstructed or damaged and is correctly attached to pilot and gas valve.
- Verify pilot ignition electrode, electrode ceramic and spark lead wire from control are in good condition. Spark gap should be approximately 1/8".
- Correct any above problems, replacing pilot if burner or wiring is damaged.
- Reinstall burner shield to operate boiler for retest after any changes or corrections.
- If none of the above corrects problem, then replace the control module and retest.

Yes → ▲TURN OFF POWER▲ to boiler at service switch or breaker.
- Remove burner shield (see *Figure 37, item 4, page 60*, for location).
- Verify pilot burner is securely attached to pilot bracket, bracket is securely attached to cross tie, and there is no corrosion on the parts which would affect the ground path for flame sense.
- Verify that pilot flame rod, flame rod ceramic and lead wire from control module to flame rod are in good condition.
- Correct any above problems, replacing pilot if burner or wiring is damaged.

- Is pilot flame visible through inspection port?

No → Check the voltage across terminals PV and PV/MV of the gas valve.

Is 24 VAC present there?

Yes → If the wiring from the control module to gas valve is intact, replace the control module.
- Retest.

No → Check the voltage across terminals MV and PV/MV of the gas valve.

Is 24 VAC present there?

No → Verify inlet gas pressure at gas valve:

Natural gas — 5.0" w.c. min/14.0" w.c. max

Is gas present at gas valve inlet and within above range?

No → Contact gas supplier to correct pressure or gas supply.

Yes → ▲TURN OFF POWER▲ to boiler at service switch or breaker.
- Check flame signal — Detach sense lead from ignition control (*Figure 35, item 8, page 48*).
- Connect **negative** lead of MICROAMMETER to control sense terminal (*Figure 35, item 8, page 48*). Connect positive lead of MICROAMMETER to sense wire.
- DISCONNECT **red** wire connected to terminal **MV** of the gas valve.
- Turn on power to boiler and allow to cycle. As soon as pilot is burning, the MICROAMMETER should read at least 1.0 microamp.

Is flame signal at least 1.0 microamp?

No → If none of the previous steps (including replacing pilot) corrects problem, then replace the control module, reinstall burner shield and retest.

Yes → If the wiring from the control module to gas valve is intact, replace the control module and retest.

Yes → Make sure ground wire terminal is securely fastened to control module mounting screw.

Yes → Verify inlet gas pressure at gas valve:

Natural gas — 5.0" w.c. min/14.0" w.c. max

Is gas present at gas valve inlet and within above range?

Yes → ▲TURN OFF POWER▲ to boiler at service switch or breaker.
- Remove burner shield (see *Figure 37, item 4, page 60*, for location).
- Verify pilot gas line is not kinked, obstructed or damaged and is correctly attached to pilot and gas valve.
- Verify pilot ignition electrode, electrode ceramic and spark lead wire from control are in good condition. Spark gap should be approximately 1/8".
- Correct any above problems, replacing pilot if burner or wiring is damaged.
- Reinstall burner shield to operate boiler for retest after any changes or corrections.
- If none of the above corrects problem, then replace the control module and retest.

11c Troubleshooting — control module lights (cont.)

CHART 7 — Insufficient heat or no heat to system (POWER light on steady)

⚠WARNING Electrical shock hazard — Wherever you see ▲TURN OFF POWER▲, follow the instructions. Failure to follow instructions could result in severe personal injury, death or substantial property damage.

- Has it been at least 5 minutes since setting thermostat to call for heat? If not, wait 5 minutes. Is system heating?
- Is thermostat set to call for heat? Remove thermostat wires at boiler and check continuity across the two wires. If circuit isn't closed, check external thermostat (zone valve, relay, etc.) wiring. Correct problems and retry.
- Reconnect external thermostat wiring at boiler.

Is thermostat circuit closed (continuity across wires)?

No

Are all red lights off?

No / Yes

- Boiler is in standby.
- Set thermostat to call for heat and recheck operation.
- Verify **Sequence of operation, Figure 28**, page 34.

Wait 30 seconds. Are all red lights off?

No / Yes

Replace control module. Retest.

Yes

Is boiler System circulator operating?

No / Yes

- Remove CIRCULATOR harness plug from CIRCULATOR plug receptacle (*Figure 35, Item 7, page 48*). Check with voltmeter across pins of control module receptacle.

Does voltmeter show 120 VAC across pins?

No / Yes

- Replace control module.
- Retest.

- Repair/replace circulator. Retest.
- Repair/replace wiring. Retest.

- Wait 5 minutes.

Is **FLAME** *light on?*

Yes / No

Is **LIMIT** *light on?*

No / Yes

- Check ambient temperature switch. If switch is open, boiler room temperature is too high. Check air openings. Add additional openings if needed to keep room temperature within limits.
- Check limit switch contacts with continuity checker.

Are limit switch contacts closed?

No / Yes

- Wait for boiler water to cool to temperature 20 to 30 °F lower than temperature set on limit switch.

Are limit switch contacts closed?

No / Yes

- Replace limit switch.
- Retest.

- Boiler water temperature exceeded setting on limit switch with thermostat calling for heat. Boiler is OK. (See normal sequence of operation, **Figure 28**, p. 34.)
- Also check setting on limit switch (should be above 140°F.).

Check if 3-way valve is allowing water to return to boiler from the system. If not replace 3-way actuator.

- Replace control module.
- Retest.

Check rollout switch continuity — Is switch closed?

No / Yes

- Replace rollout switch.

⚠DANGER

If rollout thermal fuse element has opened, determine cause and correct condition. Failure to do so will cause severe personal injury, death or substantial property damage.

- Check any other limit controls wired into the limit circuit. If all are OK, then replace control module.
- Retest.

Yes

- If you have sufficient heat — boiler should be in normal operating sequence. (See normal sequence of operation, **Figure 28**, page 34.)
- If you have less than sufficient heat, first check 3-way valve to be sure it is not diverting flow to tankless coil. If 3-way valve is supplying tankless coil, check tankless limit to be sure it set correctly. If 3-way valve and tankless heater low limit are set and operating correctly —

Is vent piping free of blockage?

No / Yes

- Correct conditions and recheck operation.
- See **Figure 28**, page 34, for normal sequence of operation.

- Check heat loss calculation versus boiler size.
- Clock gas input.

11d Troubleshooting — common problems

Common Problems	Common Causes	Possible Corrections
Rapid cycling — burner turns on and off frequently.	Thermostat installed where drafts or heat affect reading.	Locate thermostat on inner wall away from heat sources or cool drafts.
	Heat anticipator in thermostat adjusted incorrectly.	Adjust heat anticipator to match current draw. Refer to boiler wiring diagram.
	Incorrect high limit setting.	Have qualified service technician increase limit setting to decrease cycling. Maximum setting 220˚F.
Need to frequently add makeup water.	Leaks in boiler or piping.	Have qualified service technician repair leaks at once to avoid constant use of makeup water.
Popping or percolating noise heard in boiler.	Mineral deposits in sections due to constant use of makeup water, or incorrect pH.	Have qualified service technician repair leaks at once to avoid constant use of makeup water and check pH (between 7.0 and 8.5).
Black water condition.	Oxygen corrosion due to leaks in piping.	Have qualified service technician repair leaks at once to avoid constant use of makeup water and check pH (between 7.0 and 8.5).
Frequent release of water through relief valve.	Expansion tank sized too small or water-logged.	Have qualified service technician check expansion tank operation.

11d Troubleshooting — common problems (continued)

Common Problems	Common Causes	Possible Corrections
Metal flakes found in flueway.	Contaminated combustion air supply.	Remove sources of hydrocarbons in or near boiler area. (Bleaches, cleaners, chemicals, sprays, fabric softeners, paint remover, etc.)
	Condensation of combustion gases.	Have qualified service technician check boiler operation.
Some radiators or baseboard units do not heat or are noisy.	Air in system.	Bleed air from system through air vents in radiators or baseboard units.
	Low system pressure.	Have qualified service technician check for leaks in boiler or piping at once.
	High limit set too low.	Have qualified service technician adjust limit to higher setting.
Domestic water from tankless heater is hot then suddenly turns cold. OR Domestic water from tankless heater is always lukewarm.	Mineral deposits insulate internal waterways of heater.	Have qualified service technician delime or replace coil.
	Boiler stop-leak compound has been added to boiler water and is insulating outside of coil.	Have qualified service technican remove and clean coil AND drain and flush boiler to remove stop-leak.
	Incorrect mixing valve setting for tankless heater.	Have qualified service technician adjust mixing valve setting.
	Domestic flow rate too high.	Have qualified service technician install flow check valve set to rating of tankless heater.
	Incorrect setting on tankless heater low limit.	Have qualified service technician raise tankless low limit setting.
	3-Way valve does not work.	Have qualified service technician inspect the 3-way valve wiring, actuator and body. Check operation of valve. If actuator does not move when the boiler is shut off and there is a call for domestic water replace valve and actuator.

12a Replacement parts

Section assembly 59

Base 60

Jacket 62

Trim 64

Controls 65

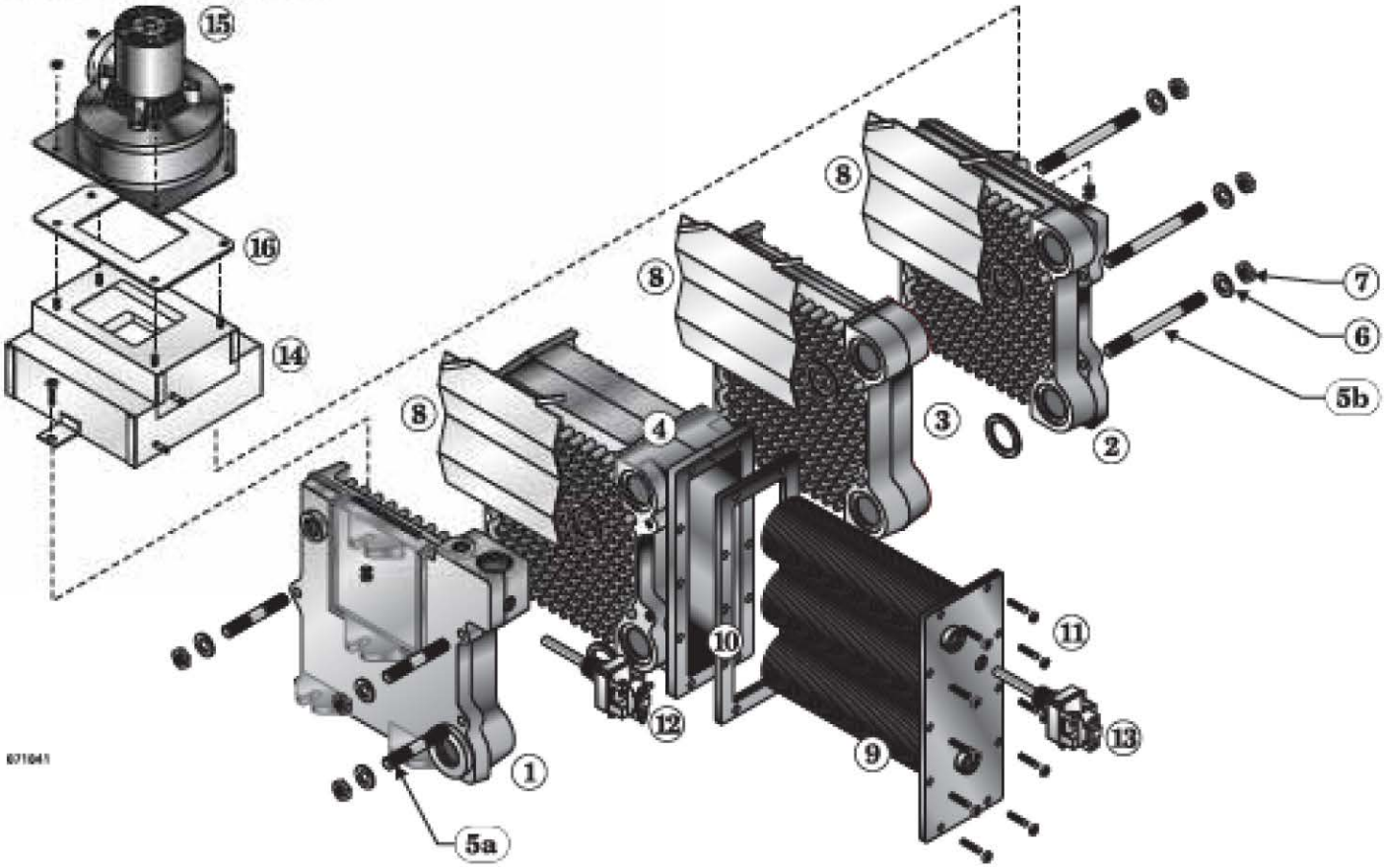
⚠WARNING Replacement parts must be purchased through a local Weil-McLain distributor. When ordering, specify boiler model and size and include description and part number of replacement part. Results from using modified or other manufactured parts will not be covered by warranty and may damage boiler or impair operation.

NOTICE Weil-McLain part numbers are found in **Weil-McLain Boilers and Controls Repair Parts Lists.**

⚠WARNING The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on **page 68** of this manual. Failure to comply could result in severe personal injury.

12b Replacement parts — section assembly

Figure 36 Section assembly

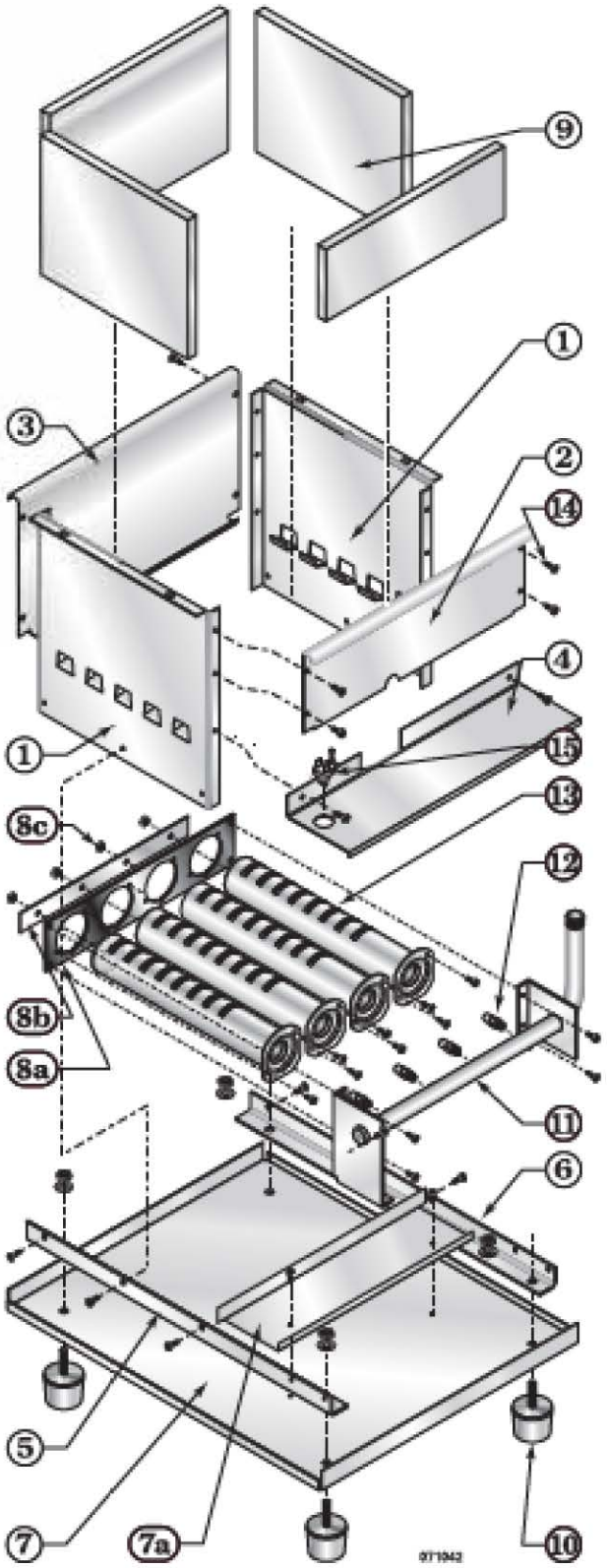


Item number	Description	Weil-McLain part number
1	End section, left hand, 51124	311-103-850
2	End section, right hand, 51128	311-103-821
3	Intermediate section, 51125	311-103-818
4	Intermediate section for tankless	311-103-840
not shown	Replacement section assembly	321-114-355
not shown	Section replacement kit, includes seals and sealant for 1 joint	381-354-527
	Tie rod, without nut	
5a	7/16" x 4.00" (Qty:3)	560-234-389
5b	7/16" x 6.75" (Qty:3)	560-234-395
6	Washer, 7/16" (1 per tie rod)	562-248-684
7	Nut, 7/16" (1 per tie rod)	561-928-235
8	Radiation plate (1 per joint)	460-003-700

Item number	Description	Weil-McLain part number
9	Tankless heater	590-921-920
10	Gasket, tankless heater	590-317-584
11	Stud and nut assembly 3/8" x 1-1/8", qty:10	560-340-577
12	High limit, 30° differential, with well Honeywell: L4080D-1036 White-Rodgers: 11B81-3	510-312-250
13	Tankless heater low limit, 8° differential, with well Honeywell: L4080D-1044	510-312-152
14	Collector hood and transition assembly	450-020-497
15	Inducer fan assembly kit, includes: inducer fan assembly, gasket and nuts	381-354-587
16	Gasket, inducer	590-317-627

12c Replacement parts — base

Figure 37 Base assembly

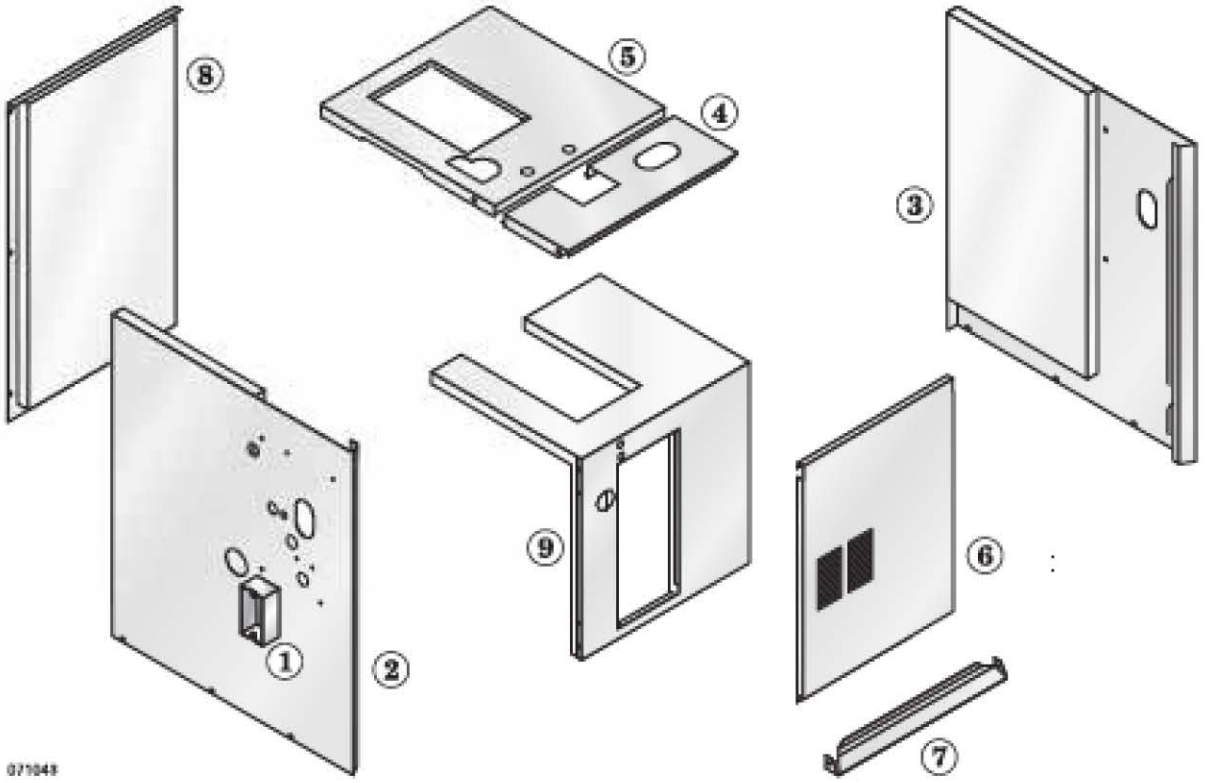


12c Replacement parts — base (continued)

Item number	Description	Weil-McLain part number
	Base assembly kit (includes base panel items 1,2,3,4,5,6 and 7)	381-354-339
1	Base side panel (in Base assembly)	
2	Base front cross-tie assembly (in Base assembly)	
3	Base back cross-tie assembly (in Base assembly)	
4	Burner shield (in Base assembly)	
5	Base pan angle, left side (in Base assembly)	
6	Base pan angle, right side (in Base assembly)	
7	Base pan (in Base assembly)	
7a	Base pan air baffle (in Base assembly)	
8a	Burner mounting plate	450-003-692
8b	Rear spacing strip	550-320-162
8c	Nut, hex 5mm Zp	550-320-170
9	Base insulation kit	381-354-332
10	Boiler leg kit	550-320-219
11	Manifold	591-126-737
12	Main burner orifice — Natural gas, 2.7mm	560-529-077
13	Burner	512-200-076
14	Screw, 10-32 x 0.38 STP Type 23 Hex., Washer Hd Slot	562-135-710
15	Rollout thermal fuse element	512-050-230

12d Replacement parts — jacket

Figure 38 Jacket assembly

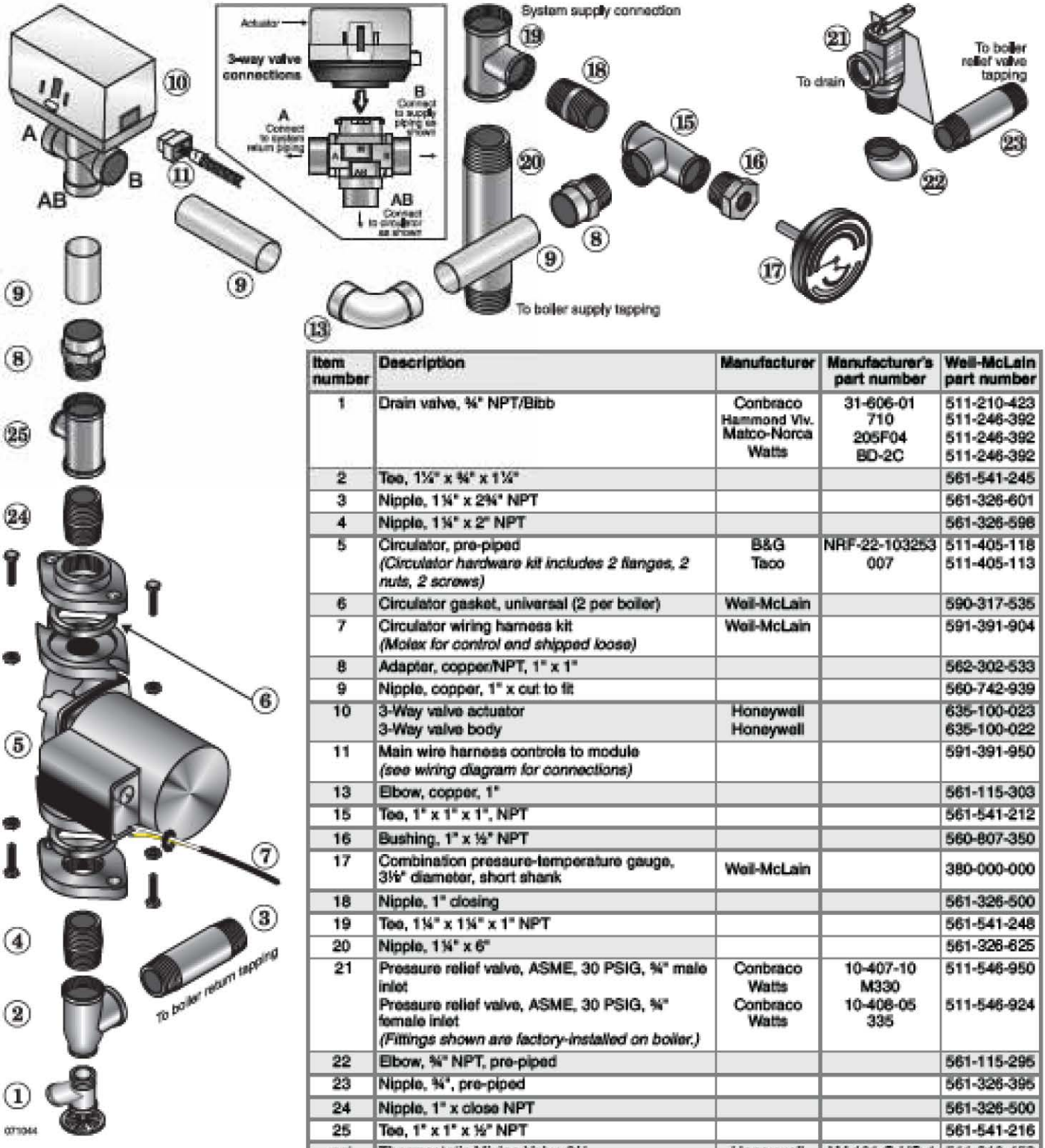


12d Replacement parts — jacket (continued)

Item number	Description	Weil-McLain part number
1	Junction box, 2 x 4 x 1.5	Available locally
2	Jacket panel, left side, with insulation	381-355-741
3	Jacket panel, right side, with insulation	381-355-793
4	Jacket panel, top front, with insulation	381-355-420
5	Jacket panel, top rear, with insulation	381-355-742
6	Jacket panel, door	381-355-744
7	Jacket cross-tie, bottom front	431-223-327
8	Jacket panel, rear, with insulation	431-223-302
9	Jacket panel, interior, with insulation	381-355-743
NS	Gold touch-up paint, spray can	592-000-000

12e Replacement parts — trim

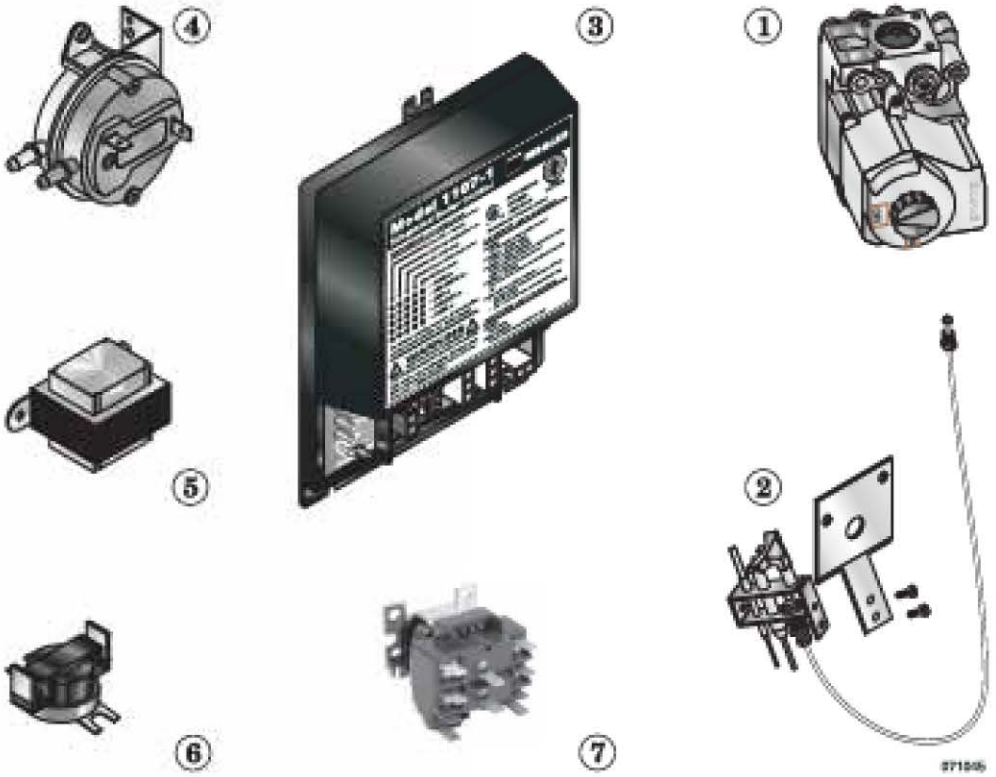
Figure 39 Trim assembly



Item number	Description	Manufacturer	Manufacturer's part number	Weil-McLain part number
1	Drain valve, ¾" NPT/Bibb	Conbraco Hammond Vlv. Matco-Norca Watts	31-606-01 710 205F04 BD-2C	511-210-423 511-246-392 511-246-392 511-246-392
2	Tee, 1¼" x ¾" x 1¼"			561-541-245
3	Nipple, 1¼" x 2¾" NPT			561-326-601
4	Nipple, 1¼" x 2" NPT			561-326-598
5	Circulator, pre-piped *(Circulator hardware kit includes 2 flanges, 2 nuts, 2 screws)*	B&G Taco	NRF-22-103253 007	511-405-118 511-405-113
6	Circulator gasket, universal (2 per boiler)	Weil-McLain		590-317-535
7	Circulator wiring harness kit *(Molex for control end shipped loose)*	Weil-McLain		591-391-904
8	Adapter, copper/NPT, 1" x 1"			562-302-533
9	Nipple, copper, 1" x cut to fit			560-742-939
10	3-Way valve actuator 3-Way valve body	Honeywell Honeywell		635-100-023 635-100-022
11	Main wire harness controls to module *(see wiring diagram for connections)*			591-391-950
13	Elbow, copper, 1"			561-115-303
15	Tee, 1" x 1" x 1", NPT			561-541-212
16	Bushing, 1" x ½" NPT			560-807-350
17	Combination pressure-temperature gauge, 3½" diameter, short shank	Weil-McLain		380-000-000
18	Nipple, 1" closing			561-326-500
19	Tee, 1¼" x 1¼" x 1" NPT			561-541-248
20	Nipple, 1¼" x 6"			561-326-625
21	Pressure relief valve, ASME, 30 PSIG, ¾" male inlet Pressure relief valve, ASME, 30 PSIG, ¾" female inlet *(Fittings shown are factory-installed on boiler.)*	Conbraco Watts Conbraco Watts	10-407-10 M330 10-408-05 335	511-546-950 511-546-924
22	Elbow, ¾" NPT, pre-piped			561-115-295
23	Nipple, ¾", pre-piped			561-326-395
24	Nipple, 1" x close NPT			561-326-500
25	Tee, 1" x 1" x ½" NPT			561-541-216
not shown	Thermostatic Mixing Valve 3/4 Kit Service Valve 3 way Cartridge Replacement	Honeywell	AM 101 C-US-1	511-210-458 511-246-398

12f Replacement parts — controls

Figure 40 Gas control assembly



Item number	Description	Manufacturer	Manufacturer's part number	Weil-McLain part number
1	Gas valve, ½" x ½"	Honeywell White-Rodgers	VR8204A2001 36E36-266	511-044-381 511-044-381
2	Pilot kit w/orifice & aluminum pilot gas tubing	Weil-McLain		511-330-080
3	Control module	United Technologies	1107-1	511-330-090
4	Air pressure switch, 1.53" w.c	Tri-Delta		511-624-542
5	Control transformer	Honeywell	AT140B1297	511-842-370
6	Ambient temperature switch (bracket not shown); 135° F; automatic reset	Therm-O-Disc	60T21 314367	540-130-401
7	Control relay DPDT 24 V	Honeywell	R8222D1014	510-311-019
not shown	Tubing, air pressure switch, 0.12 I.D. silicone red, to collector hood white, to transition	Lydall		 590-317-650 590-317-651

13a Dimensions

Figure 41 Dimensional drawing

① Supply connection, 1 ¼" NPT (*note 1*)

② Return connection, 1" NPT (*note 1*)

③ Relief valve, ¾" NPT

④ ½" NPT to expansion tank/air vent

⑤ 3" Diameter vent connection

⑥ Gas supply piping

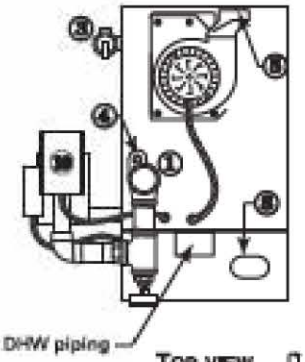
⑦ Drain valve

⑧ Gas supply entrance (top or side)

⑨ Pressure/temperature gauge

⑩ 3-way valve

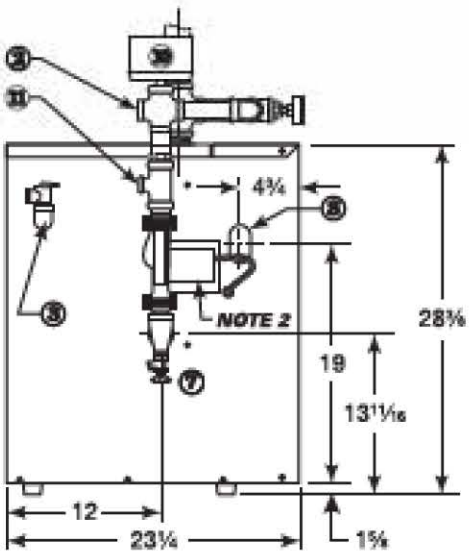
⑪ Expansion tank line connection, ½" NPT



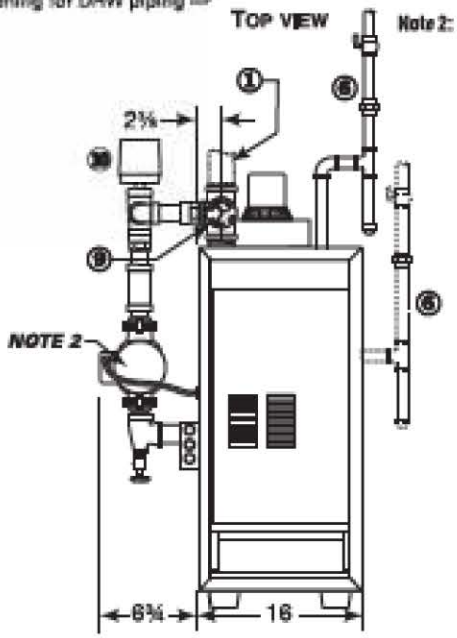
Note 1: Boiler supply connection (to tee) is 1¼" NPT. Return connection (to 3-way valve port) is 1" NPT copper tube.

Note 2: Boiler circulator, 3-way valve, piping and trim are shipped loose for field assembly. Circulator must be mounted on return line as shown in this manual.

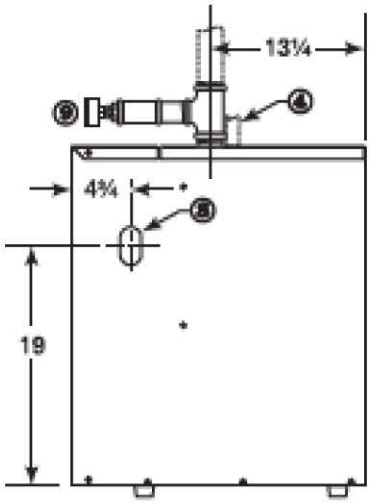
ALL DIMENSIONS IN INCHES



029008 LEFT SIDE



FRONT



RIGHT SIDE

Boiler model number	Supply tapping (inches NPT)	Return tapping (inches NPT)	Gas connection size Note 3 (inches NPT)	Gas manifold size Note 3 (inches NPT)
CGt	1 ¼	1	½	½
Note 3:	Gas piping from meter to boiler to be sized per local utility requirements.			

13b Ratings

Table 9 Boiler ratings

Boiler model number	DOE Heating capacity (Btuh)	Input (Btuh)	Output (Btuh)	Net I=B=R ratings (Btuh)	Boiler water content (gallons)	DOE Seasonal efficiency (% AFUE)	Vent size	
							Direct exhaust	Chimney draft
	(Note 1)			(Note 2)			(Note 3)	
CGt-PIN	108,000	133,000	108,000	94,000	3.1	81.0	3"	5"

Notes

1. Based on standard test procedures prescribed by the United States Department of Energy.
2. Net I=B=R ratings are based on net installed radiation of sufficient quantity for the requirements of the building and nothing need be added for normal piping and pickup. Ratings are based on a piping and pickup allowance of 1.15. An additional allowance should be made for unusual piping and pickup loads.
3. Direct exhaust CGt boilers require special venting, consistent with Category III boilers. Use only the vent materials and methods specified in this manual. Chimney draft vented CGt boilers may use type B vent or other materials suitable for venting Category I boilers.

NOTICE

CGt boilers for residential radiant panel systems, converted gravity heating systems or other low water temperature applications should be installed with balancing valves and bypass piping equal to the supply and return size to avoid excessive flue gas condensation due to lower operating water temperatures. For alternate piping, contact your Weil-McLain sales office.

CSA design certified for installation on combustible flooring.

Tested for 50 psi working pressure.

Handling ceramic fiber and fiberglass materials

REMOVAL OF COMBUSTION CHAMBER LINING OR BASE PANELS

⚠WARNING The combustion chamber lining or base insulation panels in this product contain ceramic fiber materials. Ceramic fibers can be converted to cristobalite in very high temperature applications. The International Agency for Research on Cancer (IARC) has concluded, "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1).":

Precautionary measures

- ❑ Avoid breathing fiberglass dust and contact with skin or eyes.
  - Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for fiberglass wool at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH web site at http://www.cdc.gov/niosh/homepage.html. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this web site.
  - Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
- ❑ Apply enough water to the combustion chamber lining or base insulation to prevent airborne dust.
- ❑ Remove combustion chamber lining or base insulation from the boiler and place it in a plastic bag for disposal.
- ❑ Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.

NIOSH stated First Aid.

- ❑ Eye: Irrigate immediately.
- ❑ Breathing: Fresh air.

REMOVAL OF FIBERGLASS WOOL

or

INSTALLATION OF FIBERGLASS WOOL, COMBUSTION CHAMBER LINING OR BASE PANELS:

⚠WARNING This product contains fiberglass jacket insulation and ceramic fiber materials in combustion chamber lining or base panels in gas fired products. Airborne fibers from these materials have been listed by the State of California as a possible cause of cancer through inhalation.

Precautionary measures

- ❑ Avoid breathing fiberglass dust and contact with skin or eyes.
  - Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for fiberglass wool at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH web site at http://www.cdc.gov/niosh/homepage.html. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this web site.
  - Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
- ❑ Operations such as sawing, blowing, tear out, and spraying may generate airborne fiber concentration requiring additional protection.
- ❑ Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.

NIOSH stated First Aid.

- ❑ Eye: Irrigate immediately.
- ❑ Breathing: Fresh air.

WEIL-McLAIN

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Michigan City, IN 46360-2388
http://www.weil-mclain.com

Part number 550-110-290/0212